नवीन एवं
नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF
NEW AND
RENEWABLE ENERGY

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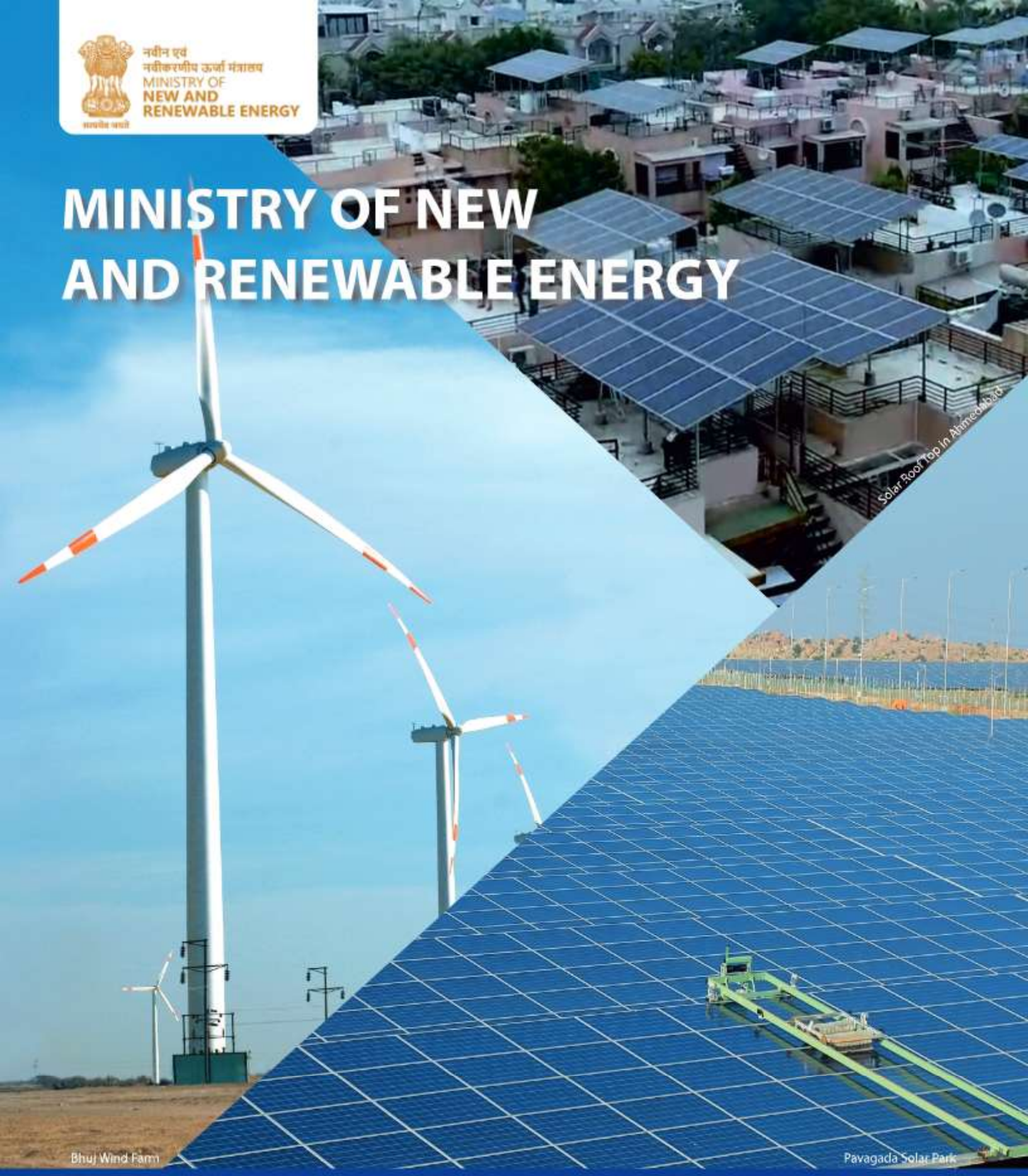
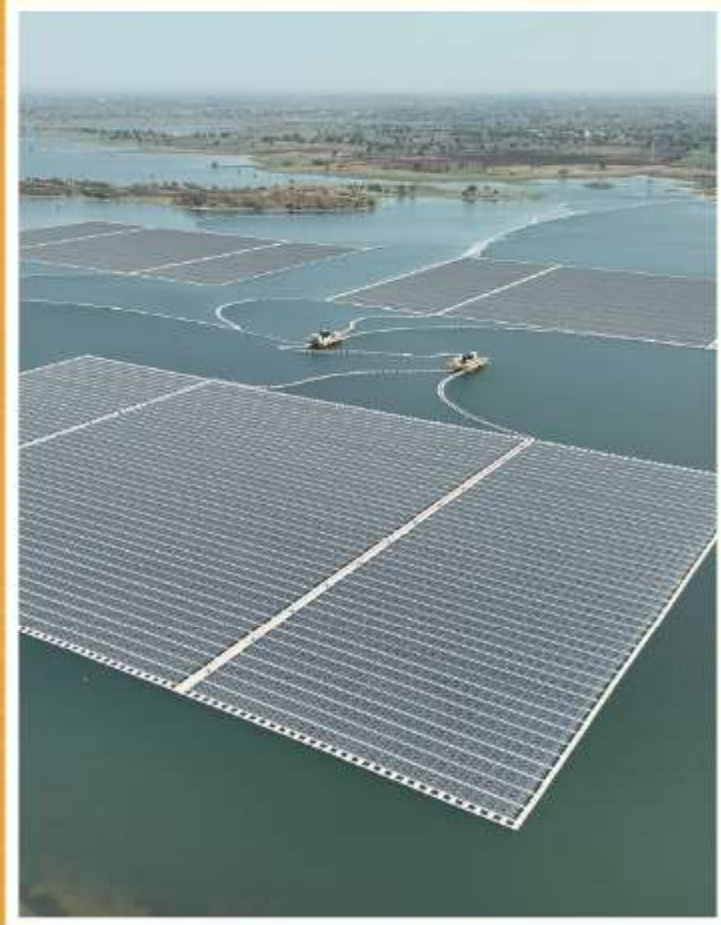


ANNUAL REPORT 2024-25



Contents

CHAPTER 1

OVERVIEW – SUMMARY

1.1. COMMITMENTS AND ACHIEVEMENTS

The year 2024 saw quantum jump in capacity expansion, policy measures, and global-scale events reinforcing India's position as a global renewable energy leader. India's renewable energy journey reached a historic milestone in 2024, surpassing 200 GW of installed capacity—a testament to the nation's unwavering commitment to its ambitious target of 500 GW by 2030.

As of December 2024, India's total renewable energy installed capacity reached 209.44 GW, marking an impressive 15.84% growth compared to 180.80 GW in December 2023. The country added 28.64 GW of capacity in 2024, representing a 119.46% year-on-year increase from 13.05 GW in 2023—a reflection of the rapid acceleration in clean energy deployment.

Over the past decade, India's installed renewable energy capacity has grown 2.74 times, rising from 76.37 GW in March 2014 to 209.44 GW in December 2024. Today, India stands 4th globally in total renewable energy installed capacity, 4th in wind power capacity, and 5th in solar power capacity[1].

The star highlight of 2024 was the launch of the PM Surya Ghar: Muft Bijli Yojana, on 13th February, a visionary scheme designed to equip one crore households with solar rooftop power. The initiative has placed residential solar at the forefront, achieving 7 lakh installations in just 10 months—a tenfold increase from pre-scheme levels. By making solar energy more accessible, the scheme is empowering millions with clean, affordable & Green electric energy.

India also took critical strides in shaping the future of green hydrogen, laying the groundwork for a robust ecosystem through pilot projects, R&D, standards, and testing infrastructure. These measures are crucial in positioning India as a global leader in the emerging hydrogen economy, fostering innovation, energy security, and industrial decarbonization.

In the offshore wind sector, the announcement of Viability Gap Funding (VGF) provided a major fillip, paving the way for accelerated project development. Additionally, India took initial steps to unlock the potential of geothermal energy, signaling a commitment to diversifying its clean energy portfolio.

The year also witnessed strategic global engagements, with the ministry hosting key events to drive policy dialogue, innovation, and international collaboration, including the 4th Global Renewable Energy Investment Meet & Expo (RE-INVEST) and the 2nd International Conference on Green Hydrogen (ICGH)—platforms that reinforced India's Global leadership in the Global Energy transition.

1. as per IRENA's Renewable Energy Statistics 2024.

Table 1.1: Sector-wise Achievements (as on 31.12.2024)

Sector-wise Achievement as on 31/12/2024	
Sector	**Installed capacity (GW)**
Solar Power	97.86
Wind Power	48.16
Bio Energy	11.35
Small Hydro Power	5.10
Sub-Total	**162.47**
Large Hydro Power	46.97
Total	**209.44**

1.2 HIGHLIGHTS UNDER MAJOR ONGOING SCHEMES

The section outlines achievements under various schemes of the Ministry during the year.

1.2.1 Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM)

MNRE in January 2024 issued the revised comprehensive scheme guidelines subsuming and simplifying all the earlier guidelines and OMs to ease the implementation of the scheme. To promote the better quality of the installation, the specifications & testing procedures of the solar pumps have been simplified and revised from time to time. Besides, as per the demand received from the states, MNRE has allocated all the capacities available under three components.

During the year 2024, the scheme PM KUSUM has seen tremendous growth in terms of installation. Under Feeder Level Solarization, states have tendered all the allocated quantities and LOAs of more than 20 GW are issued. The gestation period of the scheme is 24 months from the date of sanction, therefore most of the quantities would be installed by March 2026. Till December 2024, 397 MW have been installed in Component A, 6.16 lakhs number of pumps have been installed in Component B & 1.12 lakhs pumps has been solarized under Component C of the scheme.

1.2.2 The Pradhan Mantri Surya Ghar: Muft Bijli Yojana (PMSG: MBY)

The Pradhan Mantri Surya Ghar: Muft Bijli Yojana (PMSG: MBY) has been launched with an aim to increase the share of Solar Rooftop capacity in the country and empower residential household to generate their own electricity. This scheme targets to achieve rooftop solar installations in 1 crore household in residential sector by FY 2026-27 with an outlay of Rs. 75021 crores.

The PM Surya Ghar Muft Bijli Yojana has shown remarkable progress since its launch. As on 31.12.2024, 7.48 lakh rooftop solar systems have been installed under PMSG: MBY in 10 months, a significant achievement as compared to the 7.94 lakh installations completed over the previous 10 years before the launch of PMSG: MBY.

1.2.3 Central Public Sector Undertaking (CPSU) Scheme for Grid-Connected Solar Photovoltaic (PV) Power Projects:

As of 31.12.2024, around 8.2 GW of projects have been awarded under this scheme, with around 1.81 GW commissioned and balance is under implementation.

1.2.4 Development of Solar Parks and Ultra Mega Solar Power Projects

Under this scheme, 55 Solar Parks with a cumulative capacity of 39,958 MW in 13 states have been approved, of which, 18 solar projects with an aggregate capacity of 10,856 MW have been fully developed and 6 Solar Parks with aggregate capacity 4775 MW partially developed. Solar Projects of total capacity 12,209 MW have been commissioned in 24 parks.

1.2.5 PLI Scheme: 'National Programme on High-Efficiency Solar PV Modules'

Ministry of New and Renewable Energy, Government of India is implementing the Production Linked Incentive (PLI) Scheme for National Programme on High Efficiency Solar PV Modules, with outlay of Rs. 24,000 crores. 48,337 MW fully/ partially integrated solar PV module manufacturing capacities have been awarded under the Scheme and are under implementation.

1.2.6 Green Energy Corridor

As on 31.12.2024, 9136 km of intra-state transmission lines have been constructed, and 21413 MVA intra-state substations have been charged, under Phase-I of the Intra State Transmission System (InSTS) Green Energy Corridor (GEC). Additionally, a central grant of Rs. 2827.25 crore has been disbursed to the States under this Phase.

Under Phase-II of the InSTS GEC, 72 out of 91 packages have been tendered as on 31.12.2024. of which 52 packages have been awarded, with Rs. 384.24 crore disbursed to the States.

1.2.7 Human Resource Development Programme

A total of 57,372 Suryamitras have been trained as of 31.12.2024, of which 28,500 have gained employment. Ministry's Jal-Urjamitra Skill Development Programme coordinated by IIT-Roorkee has trained 455 candidates and 54 trainers as of 31.12.2024. Under Vayu Mitra Skill Development Programme, 281 trainers and 2070 participants were trained during this period.

1.2.8 Renewable Energy Research and Technology Development (RE-RTD) Programme

Under the Renewable Energy Research and Technology Development (RE-RTD) Programme,11 R&D projects were continued with emphasis on indigenization, cost reduction, reliability, and efficiency improvement of renewable energy systems and components.

Notable outcomes of the MNRE-supported projects include high efficiencies achieved on perovskite solar cells, the first-ever trial of hydrogen fuelled buses in Leh, Biomass Gasification through Plasma Pyrolysis Technology for Chemicals Production, establishment of primary standard solar cell facility, and establishment of the country's first hydrogen fuel cell manufacturing pilot line.

1.2.9 Solar-Wind Hybrid:

Revised 'Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Solar Hybrid Projects' was issued on 21.08.2023 to promote renewable capacity additions and RPO fulfilment, facilitate a transparent and fair procurement of electricity through competitive means; provide for a standardized framework for an Intermediary Procurer as an Aggregator/Trader; and provide a risk-sharing frame work between various stakeholders.

1.2.10 Wind Energy:

India has the fourth highest wind installed capacity in the world with a total installed capacity of 48.16 GW, as of 31.12.2024, of which 3.42 GW was added during Calendar Year 2024. In addition, 26.19 GW of projects are under implementation.

1.2.11 Bioenergy:

As on 31.12.2024, the cumulative installed capacity of bioenergy projects (cogeneration, waste to energy, and waste to power) stood at about 11.35GW. This includes biomass power and cogeneration projects of capacity 9.81 GW (Bagasse & IPP) and 0.92 GW (Non-Bagasse), and 619.94 MWeq installed capacity of Waste to Energy projects (with 249.74 MW capacity of grid-connected projects, and 370.19 MWeq of off-grid capacity).

Furthermore, as on 31.12.2024, a total of 51.04 Lakhs of small biogas plants (1-25 m^3) and 368 medium-sized biogas plants (above 25 m^3 -2500 m^3) with cumulative off-grid power generation capacity of 13.10 MW have been installed in the country.

1.2.12 Green Hydrogen:

The Green Hydrogen Mission, was launched on January 4, 2023, with an INR 19,744 crore outlay from 2023-24 to 2029-30, including an outlay of Rs. 17,490 crore for the Strategic Interventions for Green Hydrogen Transition (SIGHT) programme, Rs. 1,466 crore for pilot projects, Rs. 400 crore for R&D, and Rs. 388 crore towards other Mission components.

Tranche I of the mission has awarded 1500 MW of electrolyzer manufacturing capacity to 8 companies and another 1500 MW has been awarded to 11 companies under tranche II. In January 2024, 10 companies secured contracts for 412,000 tons per annum of Green Hydrogen, with bids for an additional 450,000 tons underway. In June 2024, bids for 739,000 tons of green ammonia were invited, while oil PSUs are processing tenders for 42,000 tons per annum of Green Hydrogen for refineries.

In 2024, MNRE formulated several new guidelines for the implementation of the various components of the Mission. These included guidelines for pilot projects in steel, shipping and mobility sectors, Green Hydrogen hubs, Skill development, standards, R&D schemes, and funding of testing infrastructure (elaborated in Para 1.3.5).

1.3 NEW INITIATIVES

Apart from the progress achieved under the schemes outlined in Section 1.2, the Ministry introduced policy reforms and enablers to push progress in segments like green hydrogen, offshore wind, solar rooftop, decentralized renewables, and geothermal energy. Key examples are noted below:

1.3.1 Viability Gap Funding (VGF) Scheme for 1000 MW Offshore Wind Energy Projects

On 11.09.2024, the Ministry launched the VGF Scheme with a total outlay of Rs. 7453 crores to support offshore wind energy projects until the year 2031-32. This included Rs. 6,853 crore for the installation of 1 GW capacity—500 MW each off the coasts of Gujarat and Tamil Nadu—and Rs. 600 crores for upgrading port infrastructure tosupport project logistics. SECI has floated tender of 500 MW offshore wind project under VGF scheme off Gujarat coast on 13.09.2024.

1.3.2 Lakshwadeep's first on-grid solar plant with battery storage

On 3.01.2024, PM Modi inaugurated Lakshadweep's first on-grid solar plant in Kavaratti featuring a combined solar capacity of 1.7 MW and 1.4 MWh battery energy storage systems (BESS). This initiative is projected to save Rs. 250 crores, towards diesel consumption and reduce diesel consumption by 190 lakh litres, and offset 58,000 tons of CO_2 emissions, marking a significant step in decreasing Lakshadweep's reliance on diesel-based power generation.

1.3.3 Empowering communities through Model Solar Village

On 9.08.2014, the Ministry notified the Model Solar Village guidelines under PM-Surya Ghar: Muft Bijli Yojana. With a ₹800 crore outlay, the scheme aims to establish one Model Solar Village per district, each receiving Rs.1 crore to promote solar adoption and energy self-reliance. Eligible revenue villages (population >5,000 or >2,000 in special category states) will compete based on installed renewable energy capacity within six months of nomination, with the village with the highest RE capacity in each district receiving the grant of Rs. 1 crore.

1.3.4 New Solar Power Scheme (for Tribal and PVTG Habitations/Villages)

MNRE initially issued approval for New Solar Power Scheme (for PVTG Habitations/Villages) under PM JANMAN on 4.1.2024, which was later revised on 18.10.2024 to also include other tribal habitations/ villages and renamed as New Solar Power Scheme (for Tribal and PVTG Habitations/Villages) under Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM JANMAN) and Dharti Aabha Janjatiya Gram Utkarsh Abhiyan (DA JGUA).

The Scheme will cover electrification of One Lakh un-electrified households (HHs) in Tribal and PVTG areas identified by Ministry of Tribal Affairs (MoTA) by provision of off-grid solar systems. The scheme includes a provision for providing off-grid solar lighting in 1500 Multi-Purpose Centres (MPCs) in PVTG areas as approved under PM JANMAN. Similarly, the scheme also includes provision for solarisation of 2000 public institutions through off-grid solar systems as approved under DA JGUA. The off-grid solar systems shall be provided only where electricity supply through grid is not techno-economically feasible.

Based on the proposals received from the state implementing agencies, electrification of 9863 PVTG households have been sanctioned till 31.12.2024, of which1410 households reported electrified through solar off-grid systems.

1.3.5 Green Hydrogen

Green Hydrogen initiatives in India have seen significant advances in the Year 2024. In February 2024, MNRE notified scheme guidelines for Steel, Shipping, and Mobility sectors. In response to the call for

proposals, MNRE sanctioned three Pilot Projects in Steel and in Mobility the deployment of 40 vehicles with 11 Hydrogen refueling stations. Additionally, on November 8, 2024, MNRE launched a new scheme with a Rs 200 crore outlay for innovative Pilot Projects focusing on Green Hydrogen production and utilization in residential, commercial, and community-based applications. Green Hydrogen Hubs scheme guidelines were introduced in March 2024, followed by a tender in August 2024 to support large-scale production.

The Government has also prioritized infrastructure development and research in the Green Hydrogen space. For funding testing facilities and developing standards and regulatory frameworks, testing infrastructure received a boost with scheme guidelines were issued in July 2024 and a Call for Proposal in August 2024. Research and Development efforts also advanced with a Call for Proposals for establishing a Centre of Excellence (CoE) being issued on November 4, 2024. For skilling, guidelines were notified in March 2024, with 37 qualifications already prepared and approved by the National Council for Vocational Education and Training (NCVET), strengthening the human resource capabilities needed for this emerging sector.

1.3.6 Task Force on Geothermal Energy

The MNRE constituted the Task Force on Geothermal Energy on 29.09.2024 to review the draft of the "India Geothermal Energy Development Network", and review the global status of the technology to shape strategic recommendations for harnessing geothermal energy in the country.

1.4 INTERNATIONAL COOPERATION

Notable highlights from the year with regard to international cooperation activities are listed below:

- The seventh session of the International Solar Alliance Annual Assembly was held on 4th November 2024 in New Delhi, where India was unanimously re-elected as President for a fourth consecutive two-year term.
- President of the 13th IRENA Assembly, the Minister of MNRE, India, opened Part I of the 14th International Renewable Energy Agency Assembly held virtually on 15th January 2024 and formally handed over the presidency to Rwanda. India also participated in Part II of the 14th IRENA Assembly, held from 16–18 April 2024 in Abu Dhabi.
- The India-Germany Platform for Investments in Renewable Energies Worldwide was launched at the 4th Global RE-INVEST 2024, for facilitating international investments in renewable energy.
- The India-Australia Renewable Energy Partnership was launched on 19th November, 2024 which would provide the framework for practical cooperation in priority areas such as solar PV, green hydrogen, energy storage, two-way investment in renewable energy projects and allied areas; and upgraded skills training for the renewables workforce of the future.

Memorandums of Understanding (MoUs) with the UAE, Nigeria, and the Netherlands, were signed for promoting bilateral cooperation in the renewable energy sector.

CHAPTER 2

MNRE SNAPSHOT

2.1 In 1982, a separate Department of Non-Conventional Energy Sources (DNES) was created in the Ministry of Energy to look after all the aspects relating to New and Renewable Energy. The Department was upgraded into a separate Ministry of Non-Conventional Energy Sources (MNES) in 1992 and was re-christened as Ministry of New and Renewable Energy (MNRE), in October 2006.

2.2 ALLOCATION OF BUSINESS RULES

As per distribution of subjects among the Ministries/Departments under allocation of Business rules, following subjects have been allocated to the Ministry of New and Renewable Energy (Naveen aur NavikarniyaOorjaMantralaya).

1. Research and development of bio-gas and programmes relating to bio-gas units.
2. Commission for Additional Sources of Energy (CASE).
3. Solar Energy - including photovoltaic devices and their development, production and applications.
4. All matters relating to small/mini/micro hydel projects of and below 25 MW capacity.
5. Programmes relating to improved chulhas and research and development thereof.
6. Indian Renewable Energy Development Agency.
7. Research and development of other non-conventional/renewable sources of energy and programmes relating thereto.
8. Tidal Energy.
9. Integrated Rural Energy Programme (IREP).
10. Geothermal Energy.

2.3 STRUCTURE OF THE MINISTRY

Smt. Nidhi Khare, IAS, (JH:1992) is the Secretary in the Ministry of New and Renewable Energy with effect from 14.01.2025. The Ministry has one Additional Secretary, one Mission Director (National Green Hydrogen Mission), one Economic Adviser, one Deputy Director General, one Joint Secretary as on 13.03.2025. Various programs are being implemented by the Ministry through State Nodal Agencies (SNAs) and channel partners.

2.4 INSTITUTIONS UNDER THE MINISTRY

To support the Ministry, there are five institutions consisting of three autonomous bodies i.e. National

Institute of Solar Energy (NISE), National Institute of Wind Energy (NIWE) and Sardar Swaran Singh - National Institute of Bio Energy (SSS-NIBE) and two public sector undertakings i.e. Indian Renewable Energy Development Agency (IREDA) and Solar Energy Corporation of India (SECI). NISE is located at Gurugram, Haryana and serves as the technical focal point for research and development in solar energy sector. NIWE is located at Chennai, Tamil Nadu and serves as the technical focal point for research & development in wind energy sector. SSS-NIBE is located at Kapurthala, Punjab and is focusing on research & development in bio energy sector. IREDA, a Non-Banking Financial Institution under the administrative control of this Ministry, provides term-loans for renewable energy and energy efficiency projects. SECI functions as the implementing and executing arm of the Ministry for implementation of the National Solar Mission and Wind energy projects. In addition, the Department of Hydro and Renewable Energy (DHRE) formerly known as the Alternate Hydro Energy Centre (AHEC), Indian Institute of Technology, Roorkee provides technical support for small hydro power development. However, DHRE is not an institution under the control of the Ministry.

2.5 PUBLIC GRIEVANCES REDRESSAL

Grievances are received in the Ministry through President's Secretariat, Prime Minister's Office, Department of Administrative Reforms and Public Grievances (DARPG), other Ministries/Departments and from the individuals concerned on MNRE's Window of CPGRAMS portal of DARPG. With a view to deliver expeditious redressal of grievances in a responsible and effective manner, the following measures have been put in place in the MNRE:-

i. Sh. Pankaj Gupta, Deputy Secretary has been designated as Liaison Officer for SC/ST/OBC for implementation of scheme of reservation for persons of Schedule Caste (SC)/ Scheduled Tribe (ST)/ Other Backward Class (OBC) categories.

ii. A committee has been constituted to enquire into the complaints of sexual harassment for any of the women working in this Ministry.

iii. DARPG has undertaken a comprehensive reform for the Centralized Public Grievance Redress and Monitoring System (CPGRAMS) to make it more responsive to the need of the citizens. In this regard, DARPG has introduced several measures for strengthening CPGRAM, viz. monitoring dashboards for stakeholders facilities deeper analysis of grievance, universalization of CPGRAMS version 7.0 for auto-routing of grievances to last mile etc.

iv. Time Frame for Redressal of the Grievance/petition is within a maximum period of 21 days.

India Achieves the Milestone of 100 GW* Solar Installed Capacity

*as on 31.01.2025

CHAPTER 3

PRADHAN MANTRI SURYA GHAR MUFT BIJLI YOJANA & INDIA'S SOLAR STORY

3.1 PM Surya Ghar: Muft Bijli Yojana (PMSG: MBY)

3.1.1 PM Surya Ghar:

Muft Bijli Yojana (PMSG: MBY) was approved by the Union Cabinet on 29th February, 2024 to increase the share of solar rooftop capacity and empower residential households to generate their own electricity. The scheme has an outlay of Rs 75,021 crore and is to be implemented till FY 2026-27. The proposed scheme will result in addition of 30 GW of solar capacity through rooftop solar in the residential sector solar and 40-45 GW of overall capacity addition by 2026-27.

3.1.2 Aim and Objectives of PMSG: MBY:

I To achieve 1 crore rooftop solar (RTS) installations in residential sector.

II To help provide free/low-cost electricity to 1 crore households up to 300 units of electricity per month by installation of RTS.

III To produce renewable electricity of 1 lakh crore units through the solar capacity installed under the scheme, which will result in reduction of 72 crore ton of CO_2 eq emission during the 25 years of lifetime for RTS projects.

IV To develop the required enabling ecosystem for RTS projects, including regulatory support, manufacturing facilities, supply chain, vendor network, operation & maintenance facilities, etc., in the country.

V To boost local economy and employment generation along with enhanced energy security.

VI To aid in achievement of India's commitment for green climate through its NDCs (Nationally Determined Contributions) at UNFCCC by installation of 30 GW of solar capacity through RTS by 2026-27.

3.1.3 The Financial Outlay for the scheme includes the following components: -

Sr. No.	Scheme Component	Outlay
1.	CFA to Residential Consumers	₹ 65,700 crore
2.	Incentives for Discoms	₹ 4,950 crore
3.	Model Solar Villages in each district	₹ 800 crore
4.	Incentives for Local Bodies	₹ 1000 crore
5.	Payment Security Mechanism	₹ 100 crore
6.	Innovative Projects	₹ 500 crore

Sr. No.	Scheme Component	Outlay
7.	Capacity Building (1% of CFA)	₹ 657 crore
8.	Awareness & Outreach (1% of CFA)	₹ 657 crore
9.	Service Charge (1% of CFA)	₹ 657 crore
	Total	**₹ 75,021 crore**

3.1.4 REC limited has been designated as the National Programme Implementing Agency (NPIA) and DISCOMs/Electricity Departments, as the case may be, will be the State Implementation Agencies (SIA).

(i) **Scheme Components**

a. **CFA to Residential Consumers:** The scheme provides central financial assistance (CFA) of 60% of benchmark costs for 2 kW RTS systems and for next additional kW 40% of benchmark costs. The CFA is capped at 3 kW and details are given below:

Sr. No.	Type of Residential Segment	CFA	CFA (Special Category States)
1.	Residential Sector (first 2 kWp)	Rs 30,000/kWp	Rs 33,000/kWp
2.	Residential Sector (additional 1 kWp)	Rs 18,000/kWp	Rs 19,800/kWp
3.	Residential Sector (above 3 kWp)	No additional CFA	No additional CFA
4.	GHS/RWA etc, for common facilities for up to 500 kWp(@3 kWp per house)	Rs 18,000/kWp	Rs 19,800/kWp

*The benchmark cost is 10% higher for Special category States/UTs (Uttarakhand, Himachal Pradesh, J&K, Ladakh, States in the North East including Sikkim, UTs of A&N and Lakshadweep)

To avail CFA, it is mandatory to install solar modules manufactured in the country using domestically manufactured solar cells. Further, Ministry has approved list of modules and manufacturers (ALMM) and it is mandatory to procure solar modules only that are approved under the ALMM.

b. **Incentive to DISCOMs:** The objective of incentivising DISCOMs is to motivate towards installation of RTS. These incentives will help DISCOMs in carrying out activities to promote installation of RTS including regulatory and administrative mechanisms. The total financial outlay for incentives to DISCOM component is Rs. 4,950 crores. The incentives will be 5% of applicable benchmark cost for capacity achieved above 10% and less than 15% of the installed base capacity and 10% of the applicable benchmark cost for capacity achieved beyond 15% of the installed base capacity. Incentives will be computed for incremental RTS capacity installed within 12 months of the base capacity at the end of previous financial year. In case, higher capacity is achieved, the total incentives would be limited to the financial outlay available for incentive under the program.

c. **Model Solar Village:** The objective is to solarize one village per district and promote uptake of solar rooftops in India. The scheme would promote green and clean energy access to electricity in the villages. An amount of ₹ 800 crore has been allocated for this component with a provision of central financial assistance of ₹ 1 crore per model village. Renewable Energy Development

Agency or in its absence, any other entity nominated by the State/UT Government will act as the Model Solar Village Implementing Agency (MSVIA).

d. **Incentive to Local Bodies:** The objective is to incentivize Urban Local Bodies (ULBs) & Panchayat Raj Institutions (PRIs) and push the deployment of residential RTS and undertake local mobilization efforts. Rs 1000 crore is allocated for this component. Every installation in residential segment in the jurisdiction of ULB or PRI, for which CFA has been transferred to consumer will be considered for calculating the incentive @ ₹1,000 per installation.The District Level Committee constituted under the scheme chaired by the District Magistrate will monitor work undertaken by ULBs & PRIs for promotion of the scheme.

e. **Payment Security Mechanism (PSM):** Provision of Rs 100 crores to set up suitable PSM for upscaling RESCO model. The payment security fund will insulate RESCO players from delays in settlement of payments from the DISCOMs/contracting party. The corpus to grow over the period through payment security charges under standard bidding guidelines or through other contributions.

f. **Support for Innovative Projects:** Allocation of Rs 500 Cr has been provisioned to implement pilots for innovations such as Block chain-based peer to peer RTS, Digital solutions for RTS, Smart building materials, RTS with EVs, Grid responsive RTS with battery storage solutions, DISCOM IT systems for RTS management, and promote new & innovative business models, (Behind the Meter Storage, Rent-A-Roof Models, Peer to Peer Sale of electricity etc.)

g. **Capacity Building:** The objective is to create more than 3 lakh skilled manpower, through fresh skilling, and up-skilling, out of which at least 1 lakh will be Solar PV Technicians. An outlay of 1% of CFA for residential consumers i.e., Rs 657 crore is allocated for Capacity Building. The National Programme Implementing Agency (NPIA) and State Implementation Agencies (SIA) which will formulate a Skilling and Capacity Building Action Plan with the approval of MNRE. Capacity building and evaluation shall be captured through the MSDE Skill India Digital Hub (SIDH) platform.There shall be a Skilling and capacity building Committee (SCBC) convene regularly to assess the national, state and department action plans submitted for consideration and grant approval or suggest modifications. Possible training agencies for capacity building include National Institute of Solar Energy (NISE), MSDE identified Agencies, National Power Training Institute (NPTI) and state institutions.

h. **Awareness and Outreach:** The objective is to create awareness among electricity consumers with focus on residential sector and to encourage residential consumers to participate in rooftop PV system installation while educating them about the process. The Financial Outlay for the scheme includes a component on Awareness and outreach with a financial budget of Rs 657 crore. NPIA and SIA are responsible to implement this component at National and State level respectively.

i. **Service Charges:** Provision of Rs. 657 Cr as service charges to national/state implementing agencies for activities including, Demand aggregation activities; Operation of IT System; Creation of working RTS cell/PMUs/PMCs in DISCOMs, SECI and MNRE;Registration process management; Availability and streamlining the process of net-metering /billing;Inspection, monitoring, development of online portal; 3rd party verification of the projects by MNRE, etc.

3.1.5 Key Elements: PM Surya Ghar: Muft Bijli Yojana

a. **National Portal:** The scheme is being implemented through the National Portal (https://www.pmsuryaghar.gov.in) where all consumers can apply, select vendors, mutually decide rate of installation and after due approvals and inspection of system, are eligible for the subsidy claim as per the installed capacity of the RTS system. The National Portal will also provide several additional functionalities including vendor discovery, product comparisons, Domestic Content Requirement (DCR) verification, integration with State portals, as well as content for consumer's awareness regarding rooftop solar.

b. **Vendor Registration and Empanelment:** Vendors has to register with the beneficiaries' Distribution Utility (DISCOM) by submitting an application with a declaration and a Performance Bank Guarantee (PBG) of ₹2.5 lakh valid for at least five years.The empanelment is valid for one year, renewable annually. The vendor is responsible to:

- Conduct a physical survey to assess the RTS capacity.
- Guide beneficiaries on the technical and financial aspects.
- Assist in obtaining necessary approvals and installing net-meters.
- Ensure compliance with technical standards and provide maintenance for five years.

DISCOMs will take action against vendors providing misleading information or failing to meet the conditions, including blacklisting and forfeiture of the PBG.

REC Limited is the Registering Authority for National Registration and multi-state registration at the National level. The vendors have to submit a bank guarantee of Rs 25 Lakh for the National registration and a bank guarantee equivalent of Rs 2.5 lakh per State/UT under which registration is being sought for multi-state registration.

c. **Vendor rating Programme:** To enhance consumer confidence and ensure high-quality installations, the PM Surya Ghar: Muft Bijli Yojana includes a comprehensive Vendor Rating Programme. This framework will evaluate and rate vendors based on consumer feedback, quality assessments, and techno-financial evaluations. The rating system will help consumers make informed choices and encourage vendors to adhere to industry best practices. The Vendor Rating Programme is designed to ensure an objective and transparent evaluation of vendors. The programme will cover all vendors registered on the National Portal, with a minimum requirement of 50 installations for eligibility.

d. **Saturation of Government Buildings:** Objective is to saturate all the government buildings with rooftop solar. No Central Financial Assistance to be provided under the Scheme for buildings in the Government sector. The Ministry is coordinating with all Central Ministries/State/UT Governments to undertake saturation of Government buildings with Rooftop Solar. In this regard, an online module has been developed on the National Portal in order to track the progress. Central Public Sector Enterprises (CPSEs) under Ministry of Power and Ministry of New and Renewable Energy have been allocated to assist all Ministries and States/UTs in undertaking RTS installations on their assets in a mission mode by December, 2025.

e. **Financing by Banks:** The scheme also provides for easy, collateral free loans from public sector banks at 7% rate of interest that can be accessed seamlessly through the Jan Samarth portal under the Department of Financial Services.

Parameter	Details
Loan amount	Solar Rooftop up to 3 kW, Maximum Loan Amount: 2.00 lakh
Eligibility	All Individuals with roof rights & sufficient roof area; No Electricity Bill overdues.
Interest Rate and Tenor	REPO + 50 bps (6.5% + 50bps = 7.00%) for 10 years
Security	Collateral free, no processing fees
Moratorium	6 Months (for installation) from the date of disbursement

f. **Additional subsidies by States/UTs**

S. No	State/UT	Subsidy
1.	Uttar Pradesh	Rs 15,000/kW up to 2 kW
2.	Haryana	Up to Rs 25,000/kW up to 2 kW (only for poor families)
3.	Uttarakhand	Rs 23,000/kW for upto 1 kW; Rs 17,000/kW upto 3 kW
4.	Goa	50% till 10 kW, 10% till 30 kW
5.	DNH & DD	Rs.10,000/kW up to 3 kW
6.	Ladakh	Rs. 20,000 /kWpupto 2 kWp; Rs. 10,000/kWp for additional 1kW
7.	Delhi	Rs. 2,000/kW upto 5 kW, generation-based incentive
8.	Assam	Rs. 15,000/kW up to 3kW; capped at Rs. 45,000
9.	Odisha	Rs 20,000/kW
10.	J&K	Rs 3,000/kW upto 3kW
11.	Lakshadweep	Rs 45,000/kW upto 2kW, Rs 27000 for next 1kW

g. **Governance Framework:** The scheme's implementation framework includes the constitution of Group of Ministers to provide overall direction and coordination for the scheme, a Steering Committee chaired by Cabinet Secretary, a State Level Coordination Committee headed by the Chief Secretary of State/Advisor to Administrator of UTs and a District Level Committee headed by the District Magistrate/District Collector. The scheme is being implemented through a Mission Directorate and REC Limited has been named as the National Programme Implementing Agency (NPIA) for the Scheme and the respective DISCOMs are designated as State Implementing Agencies (SIAs) in their respective operational areas.

3.1.6 Steps involved from Registration to release of subsidy

a. Registration on National portal by consumer through mobile number and consumer number

b. Login through OTP and Apply for required capacity of Rooftop Solar

c. Consumer details fetched directly from DISCOM through API

d. Consumer to upload bank account details.

e. Technical feasibility waived and auto load enhancement by DISCOMs.

f. Select empaneled vendor, mutually decide rates and sign agreement.

g. After installation upload details on portal

h. DISCOM to conduct inspection, testing of net-meter and agreement for net-metering.

i. Net metering installed and commissioning report by DISCOMs.

j. Subsidy paid to consumer on his/her bank account.

3.1.7 Status as on 25.03.2025:

a. **Progress:** Under the scheme, 48.31 lakh applications have been received and 10.76 lakh households have been benefited since the launch of the scheme on 13th Feb 2024.

b. **Subsidy** has been redeemed by 7.38 lakh consumers and released for 6.75 Lakh consumers and the remaining are under process.

c. **Registered vendors:** 13,443 unique vendors have been registered under the scheme, including 63 National/Multistate Vendors.

d. **Loan applications:** Till date, 1,60,860 loan applications have been received under the scheme, of which 1,88,340 applications have been sanctioned, out of which 1,44,510 have been disbursed.

e. **Simplified provisions notified by DISCOMs:** The Ministry of Power has notified amendments to Electricity (Rights of Consumers) Rules with several RTS friendly provisions such as deemed technical feasibility for small RTS systems, time-bound inspection of RTS installations etc. 76 DISCOMs in 36 States/UTs have adopted deemed feasibility provisions, substantially reducing time delays for consumers. Further, 68 DISCOMs have also approved auto load enhancement.

f. **Government building solarization:** For enabling to collate and track the data of saturation of all buildings with rooftop solar, a dedicated section has been created in the National Portal (https://pmsuryaghar.gov.in). All Central Ministries/Departments and States/UTs have been requested for the saturation of Government buildings with rooftop solar in a mission mode. In this regard, all Central Ministries/Departments and States/UTs were requested to nominate a senior officer as nodal officer for this exercise and to fill the building wise data on the National Portal. So far, 81 central ministries / departments (out of 84) and 35 States / UTs (out of 36) have nominated their nodal officers. Further, details of around 95,972 government buildings have been entered on the National Portal.

g. **Grievance management:** An online grievance raising tool has been developed as part of National Portal, which allows consumers (i.e., applicant, vendors or any other) to submit their grievances and also upload supporting documents, if any. Upon submission of the grievance, a unique ticket number is generated for tracking purpose.

Further, a call centre has also been made operational for answering queries of the interested consumers. (Call Centre Number: 15555) Call Centre is being operated by BSNL. Queries are being handled by Call Centre in 12 Languages by 60 service agents (English, Hindi, Tamil, Assamese, Bengali, Gujrati, Kannada, Malayalam, Marathi, Odia, Punjabi, Telegu). A total of 3,68,060 grievance tickets have been raised, out of which 3,53,317 tickets have been closed.

h. **Capacity Building:** 36,790 Solar installers/Engineers/Technicians have been trained by DGT. Out of all trainees, 31,846 have also completed OJT. 1105 individuals have gone through refresher training conducted by DGT, 7,940 Training for entrepreneurs as vendors has been conducted by NISEBUD, 8,820 DISCOM officials have been trained by NPTI and 424 individuals have been

trained as trainers by NPTI.

i. **Awareness and Outreach:** The awareness and outreach program for PMSG: MBY has been carried out in the entire country. Consumer awareness has been caried out through various channels such as Print advertising in leading newspapers. TV commercials campaigns in TV channels, radio campaigns across FM stations including regional channels. The PMSG: MBY WhatsApp channel is being utilized for direct engagement with consumers. Outdoor hoardings have been installed at prominent locations across the country. Several other activities are also planned to increase the awareness and outreach of the scheme across the country.

3.2 PRADHAN MANTRI KISAN URJA SURAKSHA EVAM UTTHAAN MAHABHIYAAN (PM-KUSUM) SCHEME

i. PM-KUSUM (Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan) is the flagship scheme of MNRE launched by the Government in March, 2019 to provide financial support to the farmers for installation of standalone solar pumps and solarization of existing grid-connected agriculture pumps, and also installing solar power plants on their barren/fallow agriculture land. The Scheme consists of three components: -

Component	Target	RE Capacity targeted (in GW)
Component-A	Setting up of 10000 MW of Decentralized Ground/ Stilt Mounted Grid Connected Solar or other Renewable Energy based Power Plants	10
Component-B	Installation of 14 lakh Standalone Solar Powered Agriculture Pumps	7
Component-C	Solarisation of 35 lakh existing individual Grid-connected Agriculture Pumps including Feeder Level Solarisation	17.8

ii. The total central financial support for the scheme is Rs. 34,422 crore including service charges of 2% on eligible CFA to implementing agencies.

iii. Component A aims at setting up of 10,000 MW of Decentralized Ground/ Stilt Mounted Grid Connected Solar or other Renewable Energy based Power Plants of capacity of 500 kW to 2 MW by by the farmers on his own land either directly by himself or in partnership with group of farmers/ cooperatives/ panchayats/Farmer Producer Organisations (FPO)/Water User associations (WUA). or through a developer. by leasing their land.The solar power generated shall be purchased by DISCOMs at a feed-in-tariff (FiT) determined by the respective State Electricity Regulatory Commission (SERC) within the contract capacity. DISCOM would be eligible to get PBI @ Rs. 0.40 per unit purchased or Rs. 6.6 lakh per MW of capacity installed, whichever is less, for a

period of five years from the Commercial Operation Date (COD).

iv. Under Component B, the Central Government provides financial assistance of 30% (or 50% for North Eastern Region/Hilly region/Islands) of the Benchmark Cost or the Tender Cost, whichever is lower, to install standalone Solar Agriculture pumps or replacement of existing diesel Agriculture pumps / irrigation systems in off-grid areasby Individual farmers/ Water User Associations (WUA)/Farmer Producer Organizations (FPO)/Primary Agriculture Credit Societies (PACS) or cluster-based irrigation systems.

v. Under Component C: Individual Pump Solarisation (IPS) Individual farmers/ Water User Associations (WUA)/Farmer Producer Organizations (FPO)/Primary Agriculture Credit Societies (PACS) or cluster-based irrigation systems having grid-connected agriculture pumps will be supported to solarise pumps. Solar PV capacity up to two times of pump capacity in kW is allowed under the scheme. The farmer will be able to use the generated solar power to meet the irrigation needs and the excess solar power will be sold to DISCOMs. In this case also CFA of 30% (or 50% for North Eastern Region/Hilly region/Islands) is provided.

vi. Component C: Feeder Level Solarisation (FLS), aims to solarise grid-connected agriculture pumps through FLS. However, segregation would not be the precondition for the solarization of mixed feeders which can also be solarized, however, MNRE CFA will be available based on the capacity required for agriculture consumption. Further, the States may also choose to offer virtual segregation using feeder-level (Internet of Things) IoT.

- Solar plants of capacity that can cater to the requirement of the agriculture load of the selected feeder can be installed through CAPEX/RESCO mode for a project period of 25 years.
- A dedicated online portal can be developed by the States/SIA/DISCOM which will serve as a centralized portal for land aggregation.
- CFA of 30% on the cost of installation of solar power plant (up to Rs. 1.05 Cr/MW) will be provided. However, in the North Eastern States, Sikkim, Jammu & Kashmir, Himachal Pradesh and Uttarakhand, Lakshadweep, and A&N Islands 50% (up to Rs. 1.75 Cr/MW) subsidy is available.

vii. **Steps taken in 2024-25 for enhancing the ease of implementation of PM KUSUM Scheme:**

Component	Steps taken in 2024-25
Component-A	• Meeting organized with lead banks/financial institutions to mobilize the financial support to the farmer.
	• In September, 2024, The Component A of the Scheme has also been included under Agriculture Investment Funds (AIF) for ease the Financing.
	• No penalty for any shortfall in solar power generation from solar power plants installed by farmers under Component-A
Component-B	• The scheme guidelines were revised in January 2024

Component	Steps taken in 2024-25
	• To streamline the implementation of the PM KUSUM scheme in the states where either state share is not available or is delayed, the Ministry has allowed farmers to install solar pumps under Component 'B' of the PM KUSUM scheme without State share. The CFA will remain 30%/50% with the remaining 70% in the General category state & 50% in hilly region/NER/Island being borne by the farmers.
	• State are allowed to carry out their own tender for empanelment of vendors under Component-B.
Component-C	• Comprehensive revised guidelines were issued in January 2024 for ease of implementation
	• Steps taken to remove Land-related bottlenecks in FLS by issuing simplified guidelines to aggregate land
	• States allowed to decide Land lease rate with annual escalation to facilitate the implementation
	• The advance release of CFA permitted in RESCO mode based on milestones achieved.

viii. The following workshops were organized to sensitize states and banks on financing and implementation of PM KUSUM are:

- Bankers Conclave 2024 during May 2024
- National Workshop on PM KUSUM during June 2024
- ChintanShivar 2024 during November 2024
- Outreach and Capacity building program in Component A during December 2024
- Regional Workshops on RE during January 2025 (Mumbai and Jaipur)

ix. Implementation Status: Since launch of PM KUSUM Scheme in March, 2019, capacities were sanctioned to States/ UTs based on the demand received from respective States/ UT under the three components State-wise capacity sanctioned and progress under the three components of the scheme as of 31.01.2025 is given in Table 3.1.

Table 3.1: State-wise Sanctioned Capacities under the Components of PM KUSUM Scheme

As of 31.01.2025

S. No.	State/ UT Name	Component-A (MW)		Component-B (No. of pumps)		Component-C (No. of pumps)		
		Sanctioned	Installed	Sanctioned	Installed	Sanctioned (IPS)	Sanctioned (FLS)	Solarized
1.	A & N Islands	-	-	34	-	436	-	-
2.	Andhra Pradesh	-	-	-	-	-	1,00,000	

S. No.	State/ UT Name	Component-A (MW)		Component-B (No. of pumps)		Component-C (No. of pumps)		
		Sanctioned	Installed	Sanctioned	Installed	Sanctioned (IPS)	Sanctioned (FLS)	Solarized
4.	Assam	2.00	-	4,000	-	750	-	-
5.	Bihar	-	-	-	-	-	70,000	-
6.	Chhattisgarh	30.00	4.00	10,000	-	-	-	-
7.	Goa	50.00	-	900	100	-	11,000	700
8.	Gujarat	-	-	18,212	8,762	-	7,25,000	78,173
10.	Himachal Pradesh	100.00	25.95	1,270	764	-	-	-
11.	Jammu & Kashmir	-	-	5,000	2,125	-	-	-
12.	Jharkhand	-	-	42,985	31,305	-	-	-
13.	Karnataka	-	-	41,360	1,846	-	7,66,588	2,657
14.	Kerala	-	-	8	8	43,800	25,387	7,524
15.	Ladakh	-	-	1,400	-	-	-	-
16.	Madhya Pradesh	1,790.00	44.63	59,400	7,325	-	4,45,000	7,417
17.	Maharashtra	260.00	6.00	5,05,000	2,90,444	-	7,75,000	80,965
18.	Manipur	-	-	1,150	78	-	-	-
19.	Meghalaya	-	-	3,035	98	-	-	-
20.	Mizoram	-	-	1,700	40	-	-	-
21.	Nagaland	-	-	265	65	-	-	-
22.	Odisha	40.00	-	16,441	5,640	18,750	10,000	-
23.	Punjab	-	-	33,000	12,952	186	95,000	-
24.	Rajasthan	6,550.00	329.75	1,62,914	94,579	6,418	4,00,000	13,469
25.	Tamil Nadu	14.00	1.00	5,200	4,187	5,000	6,000	-
26.	Telangana	1,000.00	-	-	-	28,000	-	-
27.	Tripura	5.00	-	10,895	3,737	3,600	-	50
28.	Uttar Pradesh	1.00	-	1,10,948	58,926	12,000	94,000	2,000
29.	Uttarakhand	-	-	5,685	813	200	-	-
30.	West Bengal	-	-	-	-	700	-	20
	Total	10,000.00	417.98	12,39,157	6,69,484	1,19,840	35,35,874	1,92,975

Note: No demand received or allocated capacity surrendered/ cancelled for low progress for States/ UTs not shown above

3.3 Grid connected Solar Projects

The Government had set a target of 100 GW of installed solar power capacity in the country by 2022 under the National Solar Mission (NSM). Further, as per the target announced in the COP26, 500 GW of non-fossil-based capacity is proposed to be achieved by 2030. The Optimal Generation Mix 2030 Report of Central Electricity Authority estimates addition of around 292 GW solar capacity by 2029-30. The target is planned to achieve through various policy decisions and schemes such as Scheme for Development of Solar Parks and Ultra-Mega Solar Power Projects, Central Public Sector Undertaking (CPSU) Scheme Phase-II (Government Producer Scheme), Production Linked Incentive scheme for 'National Programme on High Efficiency Solar PV Modules', Prime Minister KisanUrja Suraksha and UtthaanMahaabhiyan (PM-KUSUM), PM Surya GharMuftBijliYojana etc.

3.3.1 Achievements

As on 31-12-2024, a cumulative solar power capacity of 97.86 GW has been installed in the country. This includes 75.19 GW from Ground-Mounted Solar, 15.67 GW from Rooftop Solar, 2.77 GW from Solar Component of Hybrid Projects & 4.23 GW from Off-Grid Solar. In addition to this, a capacity of around 120.5 GW is under implementation and 78.67 GW of Solar/hybrid/RTC/FDRE projects are under tendering stage. It is expected that the solar power projects of capacity around 24 GW will be commissioned during this Financial Year (FY) 2024-25 including capacity from the Off-grid & Rooftop Solar.

Based upon availability of land and solar radiation, the potential solar power in the country has been assessed to be around 750 GWp by National Institute of Solar Energy (NISE). State-wise details of estimated solar energy potential in the country is given in Table-3.2:

Table-3.2 State-wise estimated Solar Energy Potential in the Country

Sl. No.	State/UT	Solar Potential (GWp)
1.	Andhra Pradesh	38.44
2.	Arunachal Pradesh	8.65
3.	Assam	13.76
4.	Bihar	11.20
5.	Chhattisgarh	18.27
6.	Delhi	2.05
7.	Goa	0.88
8.	Gujarat	35.77
9.	Haryana	4.56
10.	Himachal Pradesh	33.84
11.	Jammu & Kashmir	111.05
12.	Jharkhand	18. 18
13.	Karnataka	24.70
14.	Kerala	6.11
15.	Madhya Pradesh	61.66
16.	Maharashtra	64.32

Sl. No.	State/UT	Solar Potential (GWp)
17.	Manipur	10.63
18.	Meghalaya	5.86
19.	Mizoram	9.09
20.	Nagaland	7.29
21.	Odisha	25.78
22.	Punjab	2.81
23.	Rajasthan	142.31
24.	Sikkim	4.94
25.	Tamil Nadu	17.67
26.	Telangana	20.41
27.	Tripura	2.08
28.	Uttar Pradesh	22.83
29.	Uttarakhand	16.80
30.	West Bengal	6.26
31.	UTs	0.79
TOTAL		**748.98**

The Solar Potential Map of India is being updated by NISE encompassing various categories such as ground-mounted solar, rooftop installations, and solar PV on water bodies. This enhancement involves several critical factors including (i) Improved Solar Module Efficiency, (ii) Precise Assessment of Potential Sites, (iii) Inclusion of New Solar Applications (e.g., water bodies).

The State-wise cumulative solar installed capacity in the country as on 31-12-2024 is given in Table-3.3:

Table-3.3 State-wise Cumulative Solar Installed Capacity in the country (as on 31-12-2024)

Sl. No.	States/UTs	Installed capacity (MW)
1	Andhra Pradesh	4730.27
2	Arunachal Pradesh	14.85
3	Assam	185.44
4	Bihar	317.04
5	Chhattisgarh	1336.34
6	Goa	52.56
7	Gujarat	16795.77
8	Haryana	1986.96
9	Himachal Pradesh	162.51
10	Jammu&Kashmir	74.36
11	Jharkhand	199.87
12	Karnataka	8986.94
13	Kerala	1313.66
14	Ladakh	7.80
15	MadhyaPradesh	4973.58

Sl. No.	States/UTs	Installed capacity (MW)
16	Maharashtra	8989.36
17	Manipur	13.79
18	Meghalaya	4.28
19	Mizoram	30.39
20	Nagaland	3.17
21	Odisha	615.92
22	Punjab	1387.05
23	Rajasthan	26489.65
24	Sikkim	7.56
25	Tamil Nadu	9518.37
26	Telangana	4842.10
27	Tripura	21.23
28	Uttar Pradesh	3346.99
29	Uttarakhand	593.07
30	West Bengal	310.62
31	Andaman & Nicobar Islands	29.91
32	Chandigarh	77.05
33	Dadra & Nagar Haveli and Daman & Diu	48.12
34	Delhi	294.90
35	Lakshadweep	4.97
36	Puducherry	53.26
37	Others	45.01
	TOTAL	**97864.72**

3.4 Scheme for Development of Solar Parks and Ultra Mega Solar Power Projects:

The Scheme for "Development of Solar Parks and Ultra Mega Solar Power Projects" was rolled out on 12-12-2014 with aggregate capacity 20,000 MW. Further, the capacity of the Solar Park Scheme was enhanced from 20,000 MW to 40,000 MW on 21-03-2017 to set up at least 50 Solar Parks. The timeline of the scheme is upto**2025-26.**

Solar Park is a large chunk of land developed with all necessary infrastructures and clearances for setting up of solar projects. The capacity of the Solar Parks is generally 500 MW and above. However, smaller parks (up to 20 MW) are also considered in States/UTs where there is shortage of non-agricultural land. Approximately 4 to 5 acres per MW of land is required for setting up of Solar Parks.

Under the scheme, the Ministry provides Central Financial Assistance (CFA) of up to Rs. 25 lakh per Solar Park for preparation of Detailed Project Report (DPR). Beside this, CFA of up to Rs. 20.00 lakh per MW or 30% of the project cost, including grid-connectivity cost, whichever is lower, is also provided on achieving the milestones prescribed in the scheme. The total Central Grants approved under the Scheme is

Rs. 8100.00 crore (Rupees Eight Thousand and One Hundred Crore).

Solar Energy Corporation of India (SECI) & Indian Renewable Energy Development Agency (IREDA) implement the scheme and handle the fund being made available under the scheme on behalf of Government of India.

3.4.1 Selection of Solar Power Park Developers

The Solar Parks are developed in collaboration with the State Governments & their agencies, CPSUs and private entrepreneurs. The Solar Park implementing agency is termed as Solar Power Park Developer (SPPD) and are selected in any of the eight modes as per the Solar Park Scheme. The various modes for selection of SPPD and eligibility of CFA under various modes are given at **Table 3.4:**

Table 3.4: Different Modes under which Solar Power Parks are developed

Mode	Brief Description	CFA Pattern
Mode-1	The State designated nodal agency or a State Government Public Sector Undertaking (PSU) or a Special Purpose Vehicle (SPV) of the State Government.	Rs 12 lakh/MW or 30 % of the project cost, whichever is lower, to SPPD for development of internal infrastructure, and Rs 8 lakh/MW or 30 % of the project cost, whichever is lower, to the CTU/STU for creation of external transmission infrastructure.
Mode-2	A Joint Venture Company of State designated nodal agency and Solar Energy Corporation of India Ltd (SECI).	
Mode-3	The State designates SECI as the nodal agency	
Mode-4	(i) Private entrepreneurs with/without equity participation from the State Government (ii) Selection of private entrepreneurs based on open transparent bidding process.	
Mode-5	Central Public Sector Undertakings (CPSUs) like SECI, NTPC etc.	
Mode-6	Private entrepreneurs without any Central Financial Assistance from MNRE	No CFA
Mode-7	SECI will act as the Solar Power Park Developer (SPPD) for Renewable Energy Parks	Rs 20 lakh/MW or 30% of the project cost, whichever is lower, for external transmission infrastructure only.
Mode-8	CPSU/ state PSU/ Government organisation/ their subsidiaries or the JV of above entities can act as SPPD.	Rs 20 lakh/MW or 30% of the project cost, whichever is lower, for internal infrastructure only.

3.4.2 Progress of Solar Park Scheme

The progress of Solar Park Scheme as on 31-12-2024 is given below:

1. Capacity approved: Based on the proposals received from the States, 55 Solar Parks of aggregate capacity 39,958 MW have been approved to 13 States. These Solar Parks are at different stages of

development. The list of parks is given in Table-3.4 below.

2. Commissioned capacity of solar projects inside Solar Parks: Solar projects of aggregate capacity 12,209 MW have been commissioned inside various Solar Parks as given in the Table 3.5 below:

Table-3.5 List of Solar Parks as on 31-12-2024

S. No.	State	Solar Park	Sanctioned	Projects Commissioned
1	Andhra Pradesh	Ananthapuramu-I Solar Park	1400	1400
		Kurnool Solar Park	1000	1000
		Ananthapuramu-II Solar Park	500	400
		Kadapa Solar Park	1000	250
		Ramagiri Solar Park	300	0
2	Chhattisgarh	Rajnandgaon Solar Park	100	100
3	Gujarat	Radhnesada Solar Park	700	700
		Dholera Solar Park	1000	300
		NTPC RE Park	4750	0
		GSECL RE Park	3325	0
		GIPCL RE Park Ph-I	600	0
		GIPCL RE Park Ph-II	1200	0
		GIPCL RE Park Ph-III	575	0
4	Himachal Pradesh	Pekhubela Solar Park	53	0
5	Jharkhand	SECI Floating Solar Park	100	0
		GVREL Floating Solar Park Ph- I	755	0
		DVC Floating Solar Park Ph-II	234	0
6	Karnataka	Pavagada Solar Park	2000	2000
		Bidar Solar Park	500	0
7	Kerala	Kasargod Solar Park	105	105
		Floating Solar Park	50	0
		Kasargod Solar Park Ph-II	100	0
8	Madhya Pradesh	Rewa Solar Park	750	750
		Mandsaur Solar	250	250
		Neemuch Solar Park	500	330
		Agar Solar Park	550	550
		Shajapur Solar Park	450	105
		Omkareswar Floating Solar Park	600	278
		Morena Solar Park	600	0
		Barethi Solar Park	630	0
9	Maharashtra	Dondaicha Solar Park	250	0
		Erai Floating Solar Park	105	0
		Patoda Solar Park	250	0
		Sai Guru Solar Park	500	0

S. No.	State	Solar Park	Sanctioned	Projects Commissioned
10	Mizoram	Vankal Solar Park	20	20
11	Odisha	NHPC Solar Park	40	0
12	Rajasthan	Bhadla-II Solar Park	680	680
		Bhadla-III Solar Park	1000	1000
		Bhadla-IV	500	500
		Phalodi-Pokaran Solar Park	750	450
		Fatehgarh Phase-1B Solar Park (1500 MW but 421 MW under CFA)	421	421
		Nokh Solar Park	925	190
		Pugal Solar Park Ph-I	1000	0
		Pugal Solar Park Ph-II	1000	0
		RVUN Solar Park	2000	0
		Bodana Solar Park	2000	0
13	Uttar Pradesh	LPSDCL Solar Park in UP	365	365
		Kanpur Nagar Solar Park	35	0
		Kanpur Dehat Solar Park	75	0
		Jalaun Solar Park	1200	0
		Mirzapur Solar Park	100	0
		Kalpi Solar Park	65	65
		Jhansi Solar Park	600	0
		Lalitpur Solar Park	600	0
		Chitrakoot Solar Park	800	0
Total (In MW)			**39958**	**12209**

3.5. Scheme for "Installation of grid connected solar project & various off-grid applications for 100% Solarization of Konark Sun Temple & Konark Town"

The administrative guidelines of the Scheme for solarisation of Konark sun-temple & Konark city has been issued on 19.05.2020 with support of total CFA of around Rs. 25.00 crores as a high visibility project. Odisha Renewable Energy Development Agency (OREDA) is implementing this scheme. All off-grid applications are already commissioned and the matter regarding the 10 MW grid connected solar project is sub-judice in Hon'ble Odisha Energy Regulatory Commission.

3.6. Setting up of grid-connected Solar PV Project of capacity 25 MW(AC)/50 MW(DC) with battery storage of 40 MWh under J&K Prime Minister Development Package (PMDP) – 2015

Ministry sanctioned this project of capacity 25 MWac/50 MWdc with battery storage of 40 MWh at Taru, Leh under J&K Prime Minister Development Package (PMDP) – 2015 on 08.11.2021 with a financial support of Rs. 250 crore. The project is being implemented by SECI under EPC mode and is under implementation.

3.7 ONE SUN ONE WORD ONE GRID

Hon'ble Prime Minister of India had called for connecting the global solar resources through the vision of 'One Sun One World One Grid' (OSOWOG) with the concept that 'The Sun Never Sets' and is always shining at some geographical location, globally, at any point of time.

MNRE is conducting a study for developing the long-term vision, implementation plan, road map and institutional framework for implementing the initiative of OSOWOG. The International Solar Alliance is the implementing agency of the study. The study is being conducted by a consortium of consultants: Électricité de France (EDF), Application Européenne de Technologies et de Services (AETS), and The Energy and Resources Institute (TERI). The inception report of the study was submitted in December, 2021. The Phase-I of the study is complete and balance study is underway.

The Ministry of Power constituted a Task Force in November,2021 to identify and study the aspects (technical, operational, legal, regulatory, commercial and institutional) of grid interconnection in South Asia, South East Asia, Middle East (GCC), Africa, Europe etc.

3.8 CPSU Scheme Phase-II for setting up 12,000 MW Grid-connected Solar Photovoltaic (PV) Power Projects by Central and State PSUs, Government Organisations, with Viability Gap Funding (VGF) support for self-use or use by Government entities, either directly or through Distribution Companies (DISCOMs)

i. The Government of India, through Ministry of New & Renewable Energy (MNRE), on 05.03.2019, has approved implementation of CPSU Scheme Phase-II for setting up 12,000 MW grid-connected Solar Photovoltaic (PV) Power Projects by Central and State PSUs, Government Organisations, with Viability Gap Funding (VGF) support of Rs 8,580 crores, for self-use or use by Government/ Government entities, either directly or through Distribution Companies (DISCOMs).

ii. The Scheme is under implementation.

iii. The maximum permissible VGF was ₹0.70 crore/MW for first two tranches which was reduced to ₹0.55 crore/MW for subsequent tranches, the actual VGF to be given to a Government organizations under the Scheme is decided through bidding using VGF amount as a bid parameter to select project proponent. The VGF content will be reviewed by MNRE, for downward revision if required.

iv. Domestic Content Requirement (DCR): The scheme mandates usage of domestically manufactured solar PV cells and modules.

v. Total Investment envisaged: Rs. 48,000 crore for 12,000 MW capacity, @ Rs. 4 crore/MW.

vi. Implementation Agency: (i) For first two tranches: Solar Energy Corporation of India Limited (SECI); (ii) For subsequent tranches: Indian Renewable Energy Development Agency Limited (IREDA).

vii. Role of Implementing Agency (SECI / IREDA): Implementing Agency will handle the Scheme, on behalf of MNRE, by way of Bidding on VGF among prospective Government Producers; Scrutiny of project proposals for WTO compliance; Project progress monitoring including site inspection; Ensuring compliance of Domestic Content Requirement (DCR) by way of site inspection/ field visits; and handling of funds under the Scheme. For these activities, SECI will be given a fee of 1% of VGF disbursed.

viii. Status of implementation: Under this Scheme, the Government has so far sanctioned about 8.2 GW capacity of solar PV power plants to the following entities, out of which, as on 31.12.2024, about 1.81 GW capacity plants have been commissioned.

Table 3.6: Capacities allotted till 31.12.2024 under CPSU Scheme Phase-II

Sl. No.	Name of Government entity	Total Capacity of solar PV power plants allotted (MW)	Capacity Commissioned (MW)				
			FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25 (till 31.12.2024)	Total (MW)
1	NTPC Limited	3682	200	1232	110	131.5	1673.5
2	The Singareni Collieries Company Limited	171	90	5		21.5	116.5
3	Delhi Metro Rail Corporation Limited	3	3				3
4	Assam Power Distribution Company Limited	30*					0
5	NHDC Ltd.	25	-	-	-		Cancelled
6	Nalanda University	5			5		5
7	Indore Municipal Corporation	100*					0
8	SJVN Limited	1000					0
9	NLC India Limited	510			10		10
10	NHPC Limited	1000					0
11	IRCON International Limited	500					0
12	Solar Energy Corporation of India Limited	1200					0
	TOTAL	**8226**	**293**	**1237**	**125**	**153**	**1808**

**10 MW out of 30 MW awarded to Assam Power Distribution Company Limited have been cancelled; 40 MW out of 100 MW awarded to Indore Municipal Corporation have been cancelled.*

3.9 OFF GRID AND DECENTRALISED SOLAR PV APPLICATIONS PROGRAMME

Under the Off-Grid and Decentralized Solar PV Applications Programme, Ministry provided Central Financial Assistance for the deployment of Solar Street Lights, Solar Study Lamps/Lanterns, Solar Home Lighting Systems, Standalone Solar Pumps and Solar Power Packs to meet the electricity and lighting needs of local communities, institutions, and individuals mainly in rural areas. The Phase-III of the Programme was closed in March 2021 and further continuation of the Programme was not agreed by the Finance Ministry.

3.10 FRAME WORK FOR PROMOTION OF DECENTRALISED RENEWABLE ENERGY (DRE) LIVELIHOOD APPLICATIONS

The Ministry on 14.02.2022 issued a Framework for the Promotion of Decentralized Renewable Energy (DRE) Livelihood Applications to facilitate development of an enabling ecosystem for widespread access and to promote sustainable livelihoods through DRE in the country, including in the rural and remote areas.

3.11 SOLARISATION OF FORWARD DEFENCE LOCATIONS (FDLs)

The Ministry in August 2022 had sanctioned a project for the Solarisation of 115 Forward Defence Locations (FDLs) of the Border Security Force (BSF) at Jammu & Kashmir Frontier with a total Off-grid Solar PV capacity of 1.21 MWp and Central Financial Assistance of Rs.16.73 Cr. The BSF has completed the tendering process and issued Letter to Awards (LoA) to the selected vendors. The time lines for completion of balance FDLs have been extended up to August 2025.It has been reported that solarisation of 29 FDLs have been completed under the Project as on 31.12.2024.

3.12 NEW SOLAR POWER SCHEME (FOR TRIBAL AND PVTG HABITATIONS/ VILLAGES)

The Union Cabinet in November 2023, approved Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM JANMAN) to focus on eleven critical interventions through Nine-line Ministries for implementation. The Mission, inter-alia, covers implementation of New Solar Power Scheme (for Particularly Vulnerable Tribal Groups (PVTG) Habitations/Villages) for electrification of one lakh number of un-electrified households (HHs) in PVTG areas located in 18 States, by provision of off-grid solar systems where electricity supply through grid is not techno-economically feasible. In addition, the New Solar Power Scheme has a provision for providing solar lighting in 1500 Multi-Purpose Centers (MPC) in PVTG areas where electricity through grid is not available. The implementation guidelines were issued in January 2024.

The Union Cabinet in September 2024 approved Pradhan Mantri Janjatiya Unnat Gram Abhiyan for improving the socio-economic condition of tribal communities, by adopting saturation coverage for tribal families in tribal-majority villages and aspirational districts.The Mission will cover around 63,000 tribal majority villages in 549 districts and 2,740 blocks spread across 30 States / UTs benefitting more than 5 crore tribal people. The Mission inter-alia, provides scaling up of the New Solar Power Scheme covering:

- Electrification of One Lakh un-electrified households in Tribal and PVTG areas identified by Ministry of Tribal Affairs by provision of off-grid solar systems.
- Providing off-grid solar lighting in 1500 Multi-Purpose Centres in PVTG areas as approved under

PM JANMAN.

- Solarisation of 2000 public institutions through off-grid solar systems.

The off-grid solar systems shall be provided only where electricity supply through grid is not techno-economically feasible. The Mission was later renamed as Dharti Aaba Janjatiya Gram Utkarsh Abhiyan (DA JGUA).

Accordingly, Ministry issued the guidelines for New Solar Power Scheme (for Tribal and PVTG Habitations/Villages) under PM JANMAN and DA JGUA in October 2024. The financial outlay approved for the scheme is given below:

S. No.	Components	Central Share (100%)	Approved Financial Outlay (in Rs. Crore)	Timeline
1	Provision of 0.3 kW Solar off-grid system for 1 lakh Tribal and PVTG HHs	Rs. 50,000 per HH or as per actual cost	500	FY 2023-24 to FY 2025-26
2	Solar street lighting and provision of lighting in 1500 MPCs of PVTG areas	Rs. 1 lakh per MPC	15	
3	Solarisation of 2000 public institutions through off-grid solar systems	Rs 1 lakh per kW	400	FY 2024-25 to FY 2028-29

Based on the proposals received from states under the Scheme, Ministry has sanctioned electrification of total 9863 un-electrified PVTG households through off-grid solar PV in seven states namely Andhra Pradesh, Chhattisgarh, Jharkhand, Karnataka, Madhya Pradesh, Telangana and Tripura. The state implementing agencies have reported electrification of 1410 households against sanctioned 9863 households as on 31.12.2024.

3.13 GREEN ENERGY CORRIDOR

3.13.1 Intra-State Transmission System Green Energy Corridor Phase-I

i. The InSTS GEC scheme with total target of approx. 9700 ckm intra-state transmission lines and approx. 22600 MVA sub-stations was approved by the Cabinet Committee on Economic Affairs (CCEA) in 2015. The InSTS GEC scheme is currently under implementation by the State Transmission Utilities (STUs) of 8 RE rich States, i.e. Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan & Tamil Nadu. The project cost is Rs. 10,141.68 crore with funding mechanism consisting of 40% central grant from MNRE (Rs. 4056.67 crore), 40% loan from KfW Germany (EUR 500Million) and 20% equity by the STUs. The projects are being set up for evacuation of approx. 24 GW of RE power in the above 8 States.

ii. As on 31.12.2024, 9136 ckm of transmission lines have been constructed and 21413 MVA of substations have been charged. Out of the 8 States, 4 have completed all the projects, viz. Rajasthan, Madhya Pradesh, Tamil Nadu and Karnataka. In the remaining four states Andhra Pradesh, Himachal Pradesh and Gujarat have been given the extension up to June 2025 and Maharashtra have been given the extension up to December 2024. The delay is mainly due to right of way (RoW) issues and forest clearances. As on

31.12.2024, cumulative grant of Rs. 2827.23 crore has been disbursed to the States.

3.13.2 Intra-State Transmission System Green Energy Corridor Phase-II

i. The InSTS GEC-II scheme with total target of 10753 ckm intra-state transmission lines and 27546 MVA sub-stations was approved by the CCEA in January 2022. The InSTS GEC-II scheme is currently under implementation by the State Transmission Utilities (STUs) of 7 States, i.e. Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh. The scheduled commissioning timeline for the projects under this scheme is March 2026.

ii. The project cost is Rs. 12031.33 crore with central financial assistance from MNRE of Rs. 3970.34 crore (i.e. 33% of project cost). The projects are being set up for evacuation of approx. 20 GW of RE power in the above 7 States. There are total 92 packages and currently, these are under various stages of tendering. As on 31.12.2024, a total of 72 packages have been tendered out of total 91 packages in which 52 have been awarded.

3.13.3 Green Energy Corridor - Inter-State Transmission System for 13 GW RE Projects in Ladakh

i. MNRE plans to set up 13000 MW RE along with 12000 MWh Battery Energy Storage System (BESS) in Ladakh. On 18.10.2023, the Cabinet Committee on Economic Affairs approved construction of an Inter-State Transmission System for power evacuation and grid integration of the 13 GW RE project in Ladakh and despatch of power from the U.T. of Ladakh to other parts of the country. The project will also ensure reliable power supply to the Ladakh region as well as Jammu & Kashmir.

ii. The project cost is Rs.20,773.70 crore and Central Grant has been approved @40% of project cost, i.e. Rs.8,309.48 crore. POWERGRID is the implementing agency. Currently, Land for Pang has been acquired and land for Kaithal HVDC Terminal Stations have been identified and acquisition is under progress. Basic infrastructure establishment works started at Pang. Front End Engineering and Design (FEED-1) Studies have been completed. NIT for main HVDC Tender published on 18th July-2024. Subsequently, based on vendor inputs request sent to MoP to allow Global Competitive Bidding (GCB) for VSC HVDC Substation Packages. Approval received from MoP on 27.12.2024. Retendering in GCB Mode by 15.01.2025. LIDAR Survey for Pang-Kaithal HVDC transmission line & 220kV Pang-Phyang transmission line corridor has been started. Out of a total of 18 packages, 5 packages have been tendered and 1 package has been awarded.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CHAPTER 4

WIND: ON-SHORE AND OFF-SHORE

4.1 WIND ENERGY

4.1.1 Introduction: India's wind energy sector is led by indigenous wind power industry and has shown consistent progress. The expansion of the wind industry has resulted in a strong ecosystem, project operation capabilities and manufacturing base of more than 18,000 MW per annum. The country currently has the fourth highest wind installed capacity in the world with total installed capacity of 48.16 GW (as on 31st December, 2024) of which 3.42 GW was added during calendar year 2024. The number of units generated from wind power projects during calendar year 2024 was 81.54 billion units, which contributed 4.5% of total electricity generation in the country.

4.1.2 Potential of Wind Energy in India

Wind is an intermittent and site-specific source of energy and therefore, an extensive Wind Resource Assessment is essential for the selection of potential sites. Over a period of time, the Ministry, through National Institute of Wind Energy (NIWE), has installed about 916 wind-monitoring stations all over the country and issued wind potential maps at 50 m, 80 m, 100 m, 120 m and 150 m above ground level. The latest assessment indicates gross wind power potential of 1163.85 GW in the country at 150 meter above ground level. Most of this potential exists in eight windy States as given in Table 4.1 below:

Table 4.1 Wind Power Potential in India at 150 meter above ground level (agl)

S.no	State	Wind Power Potential at 150 mtragl (GW)
1	Andhra Pradesh	123.33
2	Gujarat	180.79
3	Karnataka	169.25
4	Madhya Pradesh	55.42
5	Maharashtra	173.86
6	Rajasthan	284.25
7	Tamil Nadu	95.10
8	Telangana	54.71
	Total (8 windy States)	1136.71
	Other States	27.14
	All India Total	1163.85

The wind atlas is available on the NIWE's website http://www.niwe.res.in and wind potential map at 150 m above ground level is given below in **Fig. 4.1.**

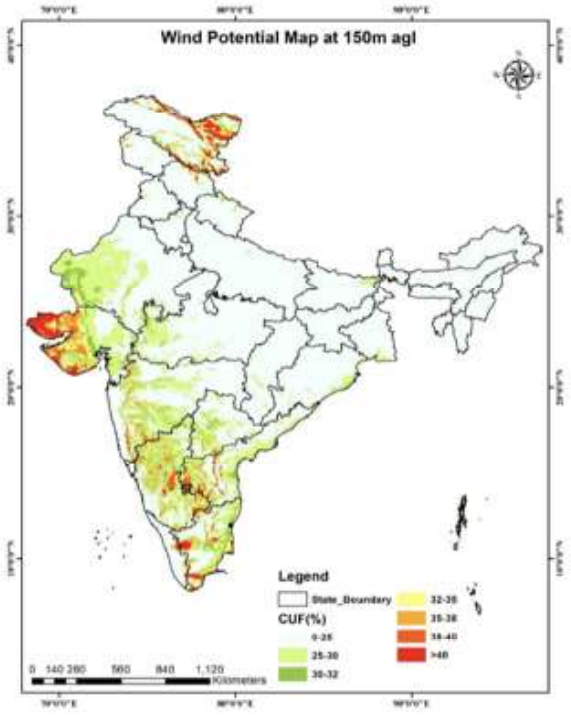

Fig. 4.1: Wind Potential Map at 150 Meters above ground level

4.1.3 Installed capacity of Wind Power in the country

The installed capacity of grid-interactive wind power in the country as on 31st December, 2024 is 48.16 GW and state wise installed capacity (in MW) is shown in Table 4.2.

Table 4.2: State wise Wind Power installed as on 31.12.2024

S.no	State	Installed Capacity (MW)
1	Andhra Pradesh	4096.65
2	Gujarat	12473.78
3	Karnataka	6731.295
4	Kerala	63.5
5	Madhya Pradesh	2844.29
6	Maharashtra	5216.38
7	Rajasthan	5195.82
8	Tamil Nadu	11409.04
9	Telangana	128.1
10	Others	4.3
	Total (MW)	**48163.155**

The year-wise electricity generation from wind energy source is shown in Table 4.3.

Table 4.3: Year wise Electricity Generation from Wind Energy Sources

S.no	Calendar Year	Generation (MU)
1	2015	32741
2	2016	43452
3	2017	52629
4	2018	60312
5	2019	63313
6	2020	60427
7	2021	68094
8	2022	70045
9	2023	82106
10	2024	81544

4.1.4 Technology development and manufacturing base for Wind Power

The Wind Turbine Generator technology has evolved and state-of-the-art technologies are available in the country for the manufacture of wind turbines. Around 70-80% localization has been achieved with strong domestic manufacturing capacity for wind energy turbines and its components in the country.

As per the guidelines for Development of Onshore Wind Power Projects, the Revised List of Models and Manufacturers of wind turbines (RLMM) enlisted turbines are eligible for installation in the country. RLMM enlistment is done based on the recommendation of RLMM committee chaired by JS(Wind) which evaluates Type Certificate, ISO Certificate, Hub, and Nacelle manufacturing/assembly facility in India. The committee meetings held on a monthly basis. During calendar year 2024, the committee has recommended 10 Nos of new wind turbine models for inclusion and 22 Nos of existing models for updation.

All the major global players in this field have their presence in the country and 31 different models of wind turbines are being manufactured by 14 different companies, through (i) joint ventures under licensed production (ii) subsidiaries of foreign companies, and (iii) Indian companies with their own technology. The unit size of the largest machine has gone up to 5.2 MW.

Wind turbines and components manufactured in India are also being exported to various countries. The current annual production capacity of wind turbines in the country is more than 18,000 MW.

4.1.5 Tender/bidding in Wind Energy sector

Government issued Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects vide resolution notified on 8th December, 2017. The Government revised its Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects vide resolution notified on 26th July, 2023. The Guidelines also been further amended vide notifications dated 17.11.2023 and 02.02.2024.

The objectives of the guidelines were to facilitate renewable capacity addition and fulfilment of RPO

requirements of distribution licensees; to provide transparent and standardized procurement framework based on competitive bidding with appropriate risk sharing between stakeholders to enable power procurement at competitive prices; improve bank ability while ensuring reasonable return to investors; provide a framework for inter-state/ intra-state, long-term, sale-purchase of power as a further measure to de-risk the sector.

The guidelines are applicable to wind power projects of minimum 10 MW capacity for intra-state projects and minimum 50 MW for inter-state projects. The salient features include capacity allocation through bucket filling method; consideration of already built-up untied capacity for participation in bid; PPAs for 20 years with provisions extension up to 25 years and generation compensation in case of grid unavailability or reduced offtake.

4.1.6 Status of tenders for Wind Power Projects

To enable DISCOMs of the non-windy States to fulfil their Wind Renewable Consumption Obligation (RCO), through purchase of wind power at a tariff determined by transparent bidding process, MNRE through Renewable Energy Implementation Agencies (SECI, NTPC, NHPC and SJVN) auctioned wind power capacity in various tranches. Further states like Gujarat, Maharashtra and Tamil Nadu have also auctioned wind power capacities.

1) Cumulative commissioned capacity till 31/12/24: 48.16 GW

2) Capacity under implementation: 26.19 GW

3) Total ongoing bids:0.6 GW

Total (1+2+3): 74.96 GW

The details of capacity awarded under wind tenders are shown in **Table 4.4.**

Table 4.4: Details of Tenders Auctioned for Wind Power

Sl. No.	Bidding Agency	Capacity awarded (MW) (A)	Capacity cancelled (MW) (B)	Net capacity (MW) (C=A-B)	Capacity Commissioned (MW)	Bidding Agency Type	Min. Tariff (Rs./kWh)
1.	SECI-I	1049.9	50	999.9	999.9	Central	3.46
2.	SECI-II	1000	239.9	760.1	760.1	Central	2.64
3.	SECI-III	2000	850	1150	950.2	Central	2.44
4.	SECI-IV	2000	1140.1	859.9	721.9	Central	2.51
5.	SECI-V	1190	300	890	621.5	Central	2.76
6.	SECI – VI	1200	227	973	973	Central	2.82
7.	SECI – VII	480	300	180	180	Central	2.79
8.	SECI – VIII	440.8	0	440.8	245.7	Central	2.83

Sl. No.	Bidding Agency	Capacity awarded (MW) (A)	Capacity cancelled (MW) (B)	Net capacity (MW) (C=A-B)	Capacity Commissioned (MW)	Bidding Agency Type	Min. Tariff (Rs./kWh)
9.	SECI IX- Blended	970	0	970	619	Central	2.99
10.	SECI X	1200	300	900	750	Central	2.77
11.	SECI XI	1200	750	450	0	Central	2.69
12.	SECI XII	1100	300	800	0	Central	2.89
13.	SECI XIII	600	0	600	0	Central	2.9
14.	SECI XIV	690	0	690	0	Central	3.18
15.	SECI Wind-XVI	1175	0	1175	0	Central	3.6
16.	SECI Wind-XVII	50	0	50	0	Central	3.81
17.	NTPC Wind-I	1150	1150	0	0	Central	2.77
18.	SJVN Wind-I	170	0	170	0	Central	3.41
19.	GUVNL Wind Phase-I	470	0	470	475.6	State	2.43
20.	GUVNL Wind Phase-II	202.6	0	202.6	160.1	State	2.8
21.	GUVNL Wind Phase-III	560	0	560	131.15	State	2.84
22.	GUVNL Wind Phase-IV	300	0	300	0	State	2.96
23.	GUVNL Wind Phase-V	350	0	350	0	State	3.11
24.	Tamil Nadu (TANGEDCO)	450	0	450	49.5	State	3.42
25.	Maharashtra (MSEDCL)	500	0	500	350	State	2.85
	Total	**20498.3**	**5607**	**14891.3**	**7987.65**		

4.1.7. Incentives available for Wind sector

The Government has taken several steps to promote renewable energy, including wind energy, in the country. These, inter alia, include;

- Notification of trajectory for RE power bids of 50 GW/annum to be issued by Renewable Energy Implementation Agencies from FY 2023-24 to FY 2027-28.
- Foreign Direct Investment (FDI) has been permitted up to 100 percent under the automatic route.
- Inter State Transmission System (ISTS) charges have been waived for inter-state sale of solar and wind power for projects to be commissioned by 30th June 2025, for Green Hydrogen Projects till December 2030 and for offshore wind projects till December 2032.
- To boost RE consumption, Renewable Purchase Obligation (RPO) followed by Renewable

Consumption Obligation (RCO) trajectory has been notified till 2029-30. The RCO which is applicable to all designated consumers under the Energy Conservation Act 2001 will attract penalties on non-compliance. RCO also includes specified quantum of consumption from Decentralized Renewable Energy sources.

- Standard Bidding Guidelines for tariff based competitive bidding process for procurement of Power from Grid Connected Solar, Wind, Wind-Solar Hybrid and Firm &Dispatch able RE (FDRE) Projects have been issued.
- Scheme for setting up of Ultra Mega Renewable Energy Parks is being implemented topro vide land and transmission to RE developers for installation of RE projects at large scale.
- Laying of new transmission lines and creating new sub-station capacity has been funded under the Green Energy Corridor Scheme for evacuation of renewable power.
- Electricity (Rights of Consumers) Rules, 2020 has been issued for net-metering up to five hundred Kilowatt or up to the electrical sanctioned load, whichever is lower.
- Uniform Renewable Energy Tariff (URET) has been introduced through which a uniform tariff will be provided to the consumer by averaging tariffs of individual RE projects of similar type awarded via tariff based competitive bidding process. Implementation of URET for "Solar Power Central Pool" and "Solar-Wind Hybrid Central Pool" from 15th February 2024 has been notified.
- To augment transmission infrastructure needed for steep RE trajectory, transmission plan has been prepared till 2030.
- The Electricity (Late Payment Surcharge and related matters) Rules (LPS rules) have been notified.
- Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022, has been notified on 06th June 2022 with objective of ensuring access to affordable, reliable, and sustainable green energy for all. Green Energy Open Access is allowed to any consumer with contract demand of 100 kW or above through single or multiple single connection aggregating Hundred kW or more located in same electricity division of a distribution licensee.
- Green Term Ahead Market (GTAM) has been launched to facilitate sale of Renewable Energy Power through exchanges.
- Government has issued orders that power shall be dispatched against Letter of Credit (LC) or advance payment to ensure timely payment by distribution licensees to RE generators.

In addition to the above, the following steps have been taken specifically for promoting wind energy:

- Declaration of trajectory for Wind Renewable Consumption Obligation (Wind RCO) up to the year 2030.
- Concessional custom duty exemption on certain components required for manufacturing of wind electric generators. During the period 1st April 2024 to 31st December, 2024, about 1370 Nos of CCDC certificates issued.
- Generation Based Incentive (GBI) is being provided to the wind projects commissioned on or before 31st March 2017.
- "National Repowering and Life Extension Policy for Wind Power Projects, 2023" has been issued.
- Technical support including wind resource assessment and identification of potential sites through the National Institute of Wind Energy, Chennai,
- Issuance of 'Elevation Certificate' by NIWE for obtaining NOC from Ministry of Defense.

- Ministry also facilitated issuance of No Objection Certificate from Ministry of Defence. In the calendar year 2024, 78 Nos of applications had been sent to MoD.

4.1.8 Offshore Wind development in India

India's main land is blessed with a coastline of about 7600 kms surrounded by seawater on three sides and has tremendous power generation potential from offshore wind energy. Considering this, the Government had notified the National Offshore Wind Energy Policy as per the Gazette Notification dated 6th October 2015. As per the policy, Ministry of New and Renewable Energy will act as the nodal ministry for development of Offshore Wind Energy in India and work in close coordination with other government entities for Development and Use of Maritime Space within the Exclusive Economic Zone (EEZ) of the country in an effective manner for production of enormous quantity grid quality electrical power for national consumption.

National Institute of Wind Energy (NIWE), Chennai has been designated as the nodal agency to execute various pre-feasibility activities relating to resource assessment, surveys and studies within EEZ (Exclusive Economic Zone), demarcation of offshore potential blocks and facilitating offshore wind energy project developers for setting up offshore wind energy farms.

Based on the preliminary assessment from satellite data and data available from other sources, potential zones off the coast of Gujarat and Tamil Nadu have been identified (Fig. 4.2 and Fig. 4.3).

Data collection (wind, geophysical, geotechnical, oceanographic) for 1.0 GW project capacity equivalent area off Gujarat coast has been completed and the rapid environmental impact assessment studies are also completed.

In order to attract the large investment needed/required for development of this sector, Government of India has already announced its intention of conducting 37 GW of offshore wind energy auctions by 2030.

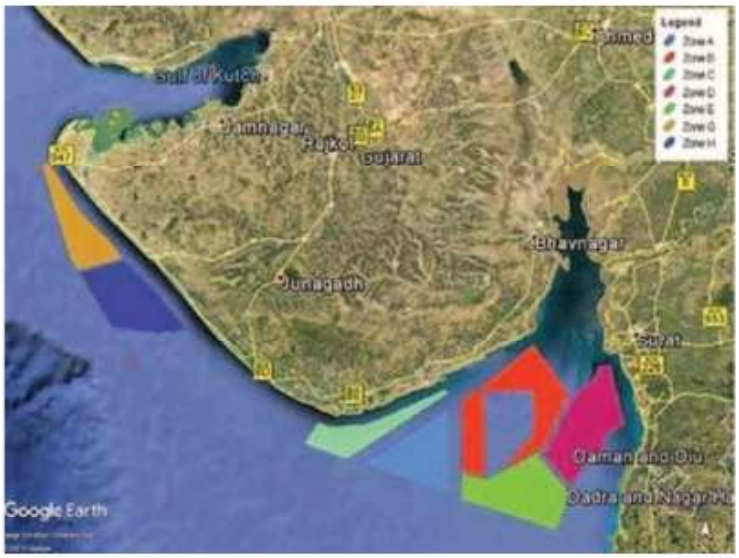

Fig. 4.2 Gujarat Offshore Wind Potential Zone

Fig. 4.3 Tamil Nadu Offshore Wind Potential Zone

4.1.9 Studies to Assess the Offshore Wind Potential

1. **Offshore measurements off Gujarat and Tamil Nadu coast:**

   LiDAR based offshore wind potential measurements for 2 years have been completed at Gulf of Khambhat off Gujarat coast. The offshore LiDAR wind data measurement report for the first and second years have been published for benefit of stakeholders. 4 Nos of LiDAR off Tamil Nadu coast (2 at VOC port & 1 at Udangudi thermal coal jetty and one Floating LiDAR at the proposed 500 MW site) installed for wind resource measurement.

2. **Geophysical investigation at Gulf of Khambhat off Gujarat coast:**

   In order to ascertain the nature of sub sea surface and soil profile available at recommended depths for the design of foundation for offshore structures, a detailed geophysical survey is required to be carried out. Onsite Geo-physical investigation (single beam bathymetry survey, side scan sonar, sub- bottom profiling, and magnetometer survey and sediment samples) covering an area of 365 sq. km for 1 GW offshore project in Gulf of Khambhat off Gujarat Coast has been completed.

3. **Geotechnical Investigation at Gulf of Khambat and Gulf of Mannar off Tamilnadu Coast:**

   In order to understand the subsoil profile and load bearing capacity of the seabed geo technical studies were carried out at five locations off the coast of Gujarat. The geo technical investigations at three locations off the coast of Tamil Nadu have been completed.

4. **Marine Spatial Planning for offshore wind farms in Tamil Nadu**

   Marine Spatial Planning (MSP) for offshore wind projects off the coast of Gujarat and Tamil Nadu were carried out as joint initiatives between India and Denmark to acknowledge the marine traffic movements in the identified offshore zones. Under MSP, the screening of offshore zones was carried out considering various key factors such as wind speed, water depth, marine traffic, oil blocks, environmentally sensitive zones, etc. with an objective to prepare Levelized Cost of Energy (LCOE) heat maps. The aim was to arrive at the best possible use of the offshore zones

for offshore wind farm development in an efficient, safe and sustainable way. Based on the MSP report, the best suitable offshore sites for initial offshore wind projects have been demarcated (Fig 4.4).

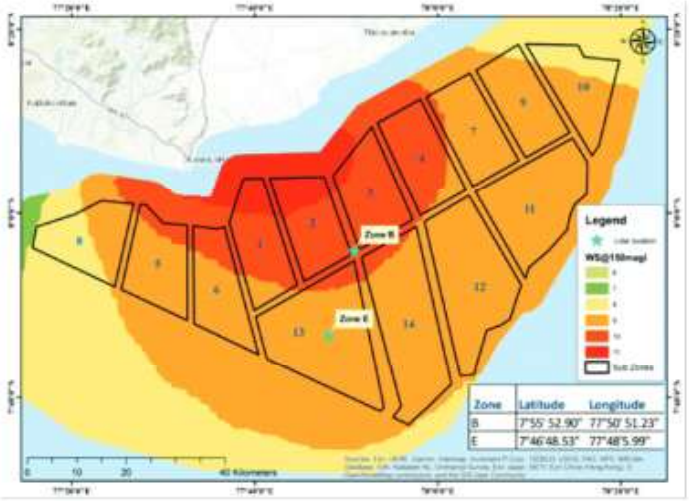

Fig 4.4: Proposed Sites for Offshore Wind Projects off the coast off Tamil Nadu

5. Port Infrastructure Study

A study with collaboration of Denmark Energy Agency (DEA) was carried out to investigate existing port and terminal infrastructure, around the identified offshore wind sites in the coastal regions of Tamil Nadu and Gujarat with respect to the specific needs of offshore wind. Four ports in Gujarat and five ports along the Tamil Nadu coast were screened for suitability for offshore wind farm. Based on the report, Pipavav and Hazira Port for Gujarat offshore wind zones and Tuticorin and Vizhinjam for Tamil Nadu offshore zones are identified for upgrading to cater to the requirements of offshore wind development (Fig 4.5 and Fig 4.6).

Fig 4.5: Ports screened for offshore wind farm off TN coast

Fig 4.6:: Ports screened for offshore wind farm Gujarat coast

4.1.10 Strategy for Offshore Wind Energy Development in India:

Ministry issued the revised "Strategy for Establishment of Offshore Wind Energy Projects" dated 26th September 2023, after consultation with various stakeholders. It also includes three revised business models for development of offshore wind projects in Economic Exclusive Zone (EEZ) of the country.

Model-A: This approach will be followed for demarcated offshore wind zones for which MNRE/NIWE has carried out or proposed to carry out detailed studies/surveys. Presently, part of identified Zone B3 (202 Sq.km) equivalent to 0.5 GW off the coast of Gujarat and 0.5 GW equivalent site off TN coast in Site No.1 is considered in phase-1 of this model. MNRE through its implementing agencies will come up with bid for procurement of offshore wind power capacity under this model. Necessary central financial assistance in the form of Viability Gap Funding (VGF) would be available to achieve a predetermined power tariff.

Model-B: This approach will be followed for sites identified by NIWE. Proposed offshore wind sites demarcated within identified zones would be allocated for a fixed period on a lease basis through single-stage two envelope bidding. Project development shall be carried out by the prospective developer in these sites without any Central Financial Assistance (CFA). The power generated from such projects shall be either used for captive consumption under open access mechanism or sold to any entity through a bilateral power purchase agreement or sold through Power Exchanges.

Model-C: In this model, Developer may identify any offshore wind site within the EEZ excluding the sites considered under Model-A & Model-B and carry out studies and surveys. The Government will come up with bid for project development/allocation of the seabed. The bidding process may be through bidding on lease/allocation fee or revenue sharing in case of projects for captive consumption/third party sale/ sale through exchange under open access mechanism; tariff based competitive bidding in case of power procurement by DISCOMs/Central Govt./State Govts.; any other transparent bidding mechanism.

The strategy paper also indicates offshore wind auction trajectory of 37 GW capacity by 2030, as given in Table 4.5 below:

Table 4.5: Offshore Wind Auction Trajectory

Year	Total Auction Trajectory	Auction Capacity under Model-A (in GW)	Auction Capacity under Model-B (in GW)	Auction Capacity under Model-C\ (in GW)
2023-24	4	-	4	-
2024-25	3.5	0.5	3	-
2025-26	7.5	0.5	3	4
2026-27	7	-	3	4
2027-28	5	-	1	4
2028-29	5	-	-	5
2029-30	5	-	-	5
Total	37	1	14	22

Central Transmission Utility has carried out transmission planning for 10 GW offshore wind capacity (05 GW each off the coast of Gujarat and Tamil Nadu) and the same has been issued vide report titled "Transmission System for Integration of over 500 GW RE Capacity by 2030" published by Central Electricity Authority (CEA).

4.1.11 Recent advancements in Offshore wind sector:

Ministry through Solar Energy Corporation of India (SECI) has issued first tender for 'Leasing out Seabed for development of 4 GW of Offshore Wind Power Projects' under Captive Mode/bilateral agreements/ Open Access Mode on 02.02.2024. The pre-bid meeting for the same convened on 27.03.2024. Based on the pre-bid meeting, the tender have been revised and published.

The Union Cabinet has approved the 'Viability Gap Funding (VGF) scheme for offshore wind energy projects' on 19.06.2024 at a total outlay of ₹ 7453 crore, including an outlay of ₹ 6853 crore for installation and commissioning of 1 GW of offshore wind energy projects (500 MW each off the coast of Gujarat and Tamil Nadu), and grant of ₹ 600 crore for upgradation of two ports to meet logistics requirements for offshore wind energy projects.

The scheme guidelines for implementation of "VGF Scheme for Offshore Wind Energy Projects" issued on 11th September 2024. SECI has issued tender for 500 MW offshore wind energy project off Gujarat coast on 13th September 2024. The pre-bid meeting for the same convened on 6th December, 2024.

4.1.12 Offshore Wind Turbine Research and Test Centre at Dhanushkodi, Tamil Nadu:

In order to strengthen the domestic capacity for design and development of new offshore wind energy turbines, a testing cum research facility was necessary and NIWE has already identified the suitable site at Dhanushkodi, Tamil Nadu for establishment of the testing cum research centre. The required land for the purpose has been allotted by Govt. of Tamil Nadu. The preliminary Detailed Project Report (DPR) Preparation for the test centre is under preparation by NIWE. Further, an EIA study is being carried out to get the necessary clearance for the project.

4.1.13 Global Wind Day Celebration – 2024

Ministry of New and Renewable Energy (MNRE) organised 'Global Wind Day' on the 15th of June 2024, aimed at celebrating the glorious success of Indian Wind Sector so far and also discussing the potential way forward for accelerating wind energy adoption in India. With a central theme of "Pawan–Urja: Powering the Future of India", the event successfully conducted panel discussions around the 'Role of Wind Energy in Meeting the Power Demand', 'Accelerating Onshore Wind Energy Adoption in India' and 'Offshore Wind Development in India: Bolstering India's Energy Security'.

Minister of State of New & Renewable Energy and Power Shri Shripad Yesso Naik, Shri Bhupinder Singh Bhalla, Secretary, MNRE and other key stakeholders from government, industry & academia were present at the event.

Fig 4.7: Global Wind Day Celebrations 2024

4.2 ENERGY FROM WIND-SOLAR HYBRID

4.2.1 National Wind-Solar Hybrid Policy: The Ministry issued National Wind-Solar Hybrid Policy on 14th May, 2018 and amended on 13th August, 2018.The main objective of the policy is to provide a framework for promotion of large- scale grid connected wind-solar PV hybrid systems for optimal and efficient utilization of wind and solar resources, transmission infrastructure and land. The wind-solar PV hybrid systems will help in reducing the variability in renewable power generation and achieving better grid stability. The policy also aims to encourage new technologies, methods and way-outs involving combined operation of wind and solar PV plants.

4.2.2 The Major Highlights of the Policy are as under:

i. A wind-solar plant will be recognized as hybrid plant if the rated power capacity of one resource is at least 25% of the rated power capacity of other resource.

ii. Both AC and DC integration of wind-solar hybrid project are allowed.

iii. The power procured from the hybrid project may be used for fulfilment of solar RPO and non-solar RPO in the proportion of rated capacity of solar and wind power in the hybrid plant respectively.

iv. Existing wind or solar power projects, willing to install solar PV plant or Wind Turbine Generators (WTGs) respectively, to avail benefit of hybrid project, may be allowed.

v. All fiscal and financial incentives available to wind and solar power projects will also be made available to hybrid projects.

vi. The Central Electricity Authority (CEA) and Central Electricity Regulatory Commission (CERC) shall formulate necessary standards and regulations including metering methodology and standards, forecasting and scheduling regulations, REC mechanism, grant of connectivity and

sharing of transmission lines, etc., for wind-solar hybrid systems.

vii. Storage may be added to the hybrid project to ensure availability of firm power for a particular period.

4.2.3 Wind-Solar Hybrid Projects

The following are the Projects under the Wind-Solar Hybrid Programme

i. In order to implement the National Wind-Solar Hybrid Policy, a scheme for setting up of 2500 MW Inter State Transmission System (ISTS) connected wind-solar hybrid projects was sanctioned on 25.05.2018. The Solar Energy Corporation of India (SECI) was the nodal agency for implementation of the scheme through tariff based transparent competitive bidding process.

ii. Guidelines for Tariff Based Competitive Bidding Process for procurement of power from Grid Connected Wind Solar Hybrid Projects were issued on 14.10.2020 and further revised on 21.08.2023. The Guidelines also been further amended vide notifications dated 17.11.2023 and 02.02.2024. The objective is to promote renewable capacity additions and RCO fulfilment; facilitate a transparent and fair procurement of electricity through competitive means; provide for a standardised framework for an Intermediary Procurer as an Aggregator/Trader; and provide a risk-sharing framework between various stakeholders. Procurement shall be from hybrid power projects with minimum bid capacity of 10 MW and 50 MW for projects connected to the intra-state transmission system and inter-state transmission system, respectively. The rated power capacity of one resource (wind or solar) shall be at least 33% of the total contracted capacity, and solar and wind components of the hybrid project can be located at the same or different locations. It has provisions for payment security mechanism, generator compensation for off-take constraints, adding storage to the hybrid power project, etc.

iii. The status of hybrid projects awarded under Wind-Solar Hybrid Policy are as under.

Sl. No.	Bid	Capacity Awarded (MW)	Capacity Commissioned (MW)	Min. Tariff (Rs./kWh)
1.	SECI Hybrid – I	840	840	2.67
2.	SECI Hybrid -II	600	600	2.69
3.	SECI Hybrid -III	1110	0	2.41
4.	SECI Hybrid -IV	1200	0	2.34
5.	SECI Hybrid -V	1170	0	2.53
6.	SECI Hybrid -VI	1200	0	4.64
7.	SECI Hybrid -VII	900	0	3.15
8.	SECI Hybrid VIII	1200	0	3.43
9.	SECI Hybrid-IX	600	0	3.25
10.	NTPC Hybrid -I	1080	0	3.35
11.	NTPC Hybrid IV	1500	0	3.27

Sl. No.	Bid	Capacity Awarded (MW)	Capacity Commissioned (MW)	Min. Tariff (Rs./kWh)
12.	NTPC Hybrid V	1000	0	3.41
13.	NTPC Hybrid VI	1000	0	3.43
14.	NTPC Hybrid-01/2024-25	1170	0	3.28
15.	NHPC Hybrid -I	960	0	3.48
16.	SJVN Hybrid -I	1500	0	3.43
17.	SJVN Hybrid-II	1500	0	3.41
18.	SJVN Hybrid-III	1200	0	3.19
19.	GUVNL Hybrid -I	200	0	2.99
20.	GUVNL Hybrid-II	832	0	3.24
	Total	**20762**	**1440**	

In addition, the status of awarded hybrid projects through assured supply during peak hours, Firm&Dispatchable Renewable Energy (FDRE) and Round the Clock (RTC) bids are as under:

Sl. No.	Bid	Capacity Awarded (MW)	Capacity Commissioned (MW)	Min. Tariff (Rs./kWh)
1.	SECI Assured Peak Power-VII	1200	289.68	2.88
2.	SECI RTC	400	0	2.9
3.	SECI FDRE-IV	630	0	4.98
4.	NTPC FDRE-I	1530	0	4.64
5.	NTPC FDRE-01	760	0	4.69
6.	NHPC FDRE-I	1400	0	4.55
7.	NHPC FDRE-II	2100	0	4.37
8.	NHPC FDRE-III	1200	0	4.48
9.	SJVN FDRE-I	2368	0	4.38
10.	SJVN FDRE-II	1200	0	4.25
	Total	**12788**	**289.68**	

4.2.4 Concessional Custom Duty Exemption Certificates for manufacturing of Wind Turbines

Ministry is issuing concessional custom duty exemption certificates (CCDCs) to the manufacturers of wind operated electricity generators as per Ministry of Finance tariff notification no. 50/2017-customs dated 30.06.2017 as amended from time to time. To avail concessional custom duty benefits for essential imports of major components/sub-components/ part/sub-parts of all such components/sub-components for such manufacturing in India, the eligible turbine and component manufacturers listed in RLMM (Registered list of Models & Manufacturers) are required to get the bill of material for turbine models approved and then apply in prescribed application formats to this Ministry for issue of CCDC (Concessional Custom Duty Certificates) for their import consignments. In order to make the entire process fast and transparent, an online portal was developed and is active since Oct, 2019. A total 1370 nos. of CCDC have been issued during calendar year 2024.

Fig 4.8

ICGH

CHAPTER 5

NATIONAL GREEN HYDROGEN MISSION (NGHM)

5.1 The National Green Hydrogen Mission (NGHM), was launched in January 2023 with an outlay of ₹19,744 crore until 2029-30, which includes ₹17,490 crore for the Strategic Interventions for Green Hydrogen Transition (SIGHT) Programme, ₹1,466 crore for pilot projects, ₹400 crore for Research & Development (R&D), and ₹388 crore for outreach, skilling, and other initiatives. The expected outcomes of the mission by 2030 are at least 5 MMT Green Hydrogen production capacity per annum, RE capacity addition of 125 GW, over Rs. 8 lakh crores in total investments, creation of over 6 lakh full time jobs and abatement of 50 MMT per annum of CO2 emissions. The key components of the Mission include incentives for Electrolyser manufacturing and Green Hydrogen production, pilot projects, R&D, regulatory frameworks, Green Hydrogen hubs, and skill development programs.

5.2 For the mission governance, an Empowered group (EG) and Advisory group (AG) have been constituted. A Mission Secretariat to coordinate the program and facilitate the day-to-day activities of the Mission has also been established and headquartered at MNRE. It comprises of a Mission Director, (who will also serve as Secretary to EG) and Program Directors and subject matter experts. The Mission Director, Shri Abhay Bakre, along with three subject matter experts and two program directors, have joined the Mission Secretariat.

5.3 Under the SIGHT, a crucial component of the NGHM mission, with a total outlay of ₹17,490 crore, two distinct financial incentive mechanisms have been established to support domestic Electrolyser manufacturing and Green Hydrogen production. Since the launch of the mission, significant progress has been made:

5.3.1 Component I: Financial Incentives for Electrolyser Manufacturing

Solar Energy Corporation of India (SECI) have issued the two tranches for the competitive bidding and contracts have been awarded for a total manufacturing capacity of 3,000 MW per annum, strengthening India's domestic electrolyser production capabilities.

5.3.2 Component II: Financial Incentives for Green Hydrogen and Its Derivatives

i. Similar to Component I, apart from supplying to refineries, SECI has issued a tender to select successful bidders through a competitive bidding process.
ii. Tranche I (January 2024): Contracts were awarded for a production capacity of 4,12,000 tons per annum.
iii. Upcoming Awards: Proposals for an additional 4,50,000 tons per annum are currently under evaluation.
iv. Green Ammonia Production: Proposals have been invited for the production and supply of 7,39,000 tons per annum.
v. Supply to Refineries: Oil PSUs have initiated tenders for the production and supply of 42,000 tons per annum of Green Hydrogen for refineries.

These initiatives aim to accelerate India's transition to a Hydrogen economy by scaling up domestic manufacturing and ensuring a steady supply of Green Hydrogen and its derivatives.

5.4 Under the Mission, pilot projects are being implemented to replace fossil fuels and fossil fuel-based feedstocks with Green Hydrogen and its derivatives. These initiatives aim to demonstrate the feasibility and scalability of Green Hydrogen technologies, particularly in hard-to-abate sectors, where significant progress has already been made.

5.4.1 The Scheme Guidelines for implementing pilot projects in the shipping sector under the Mission were published on February 1, 2024. As part of this initiative, two key projects have been identified along with their respective Scheme Implementing Agencies:

- Retrofitting of vessels – Implemented by the Shipping Corporation of India (SCI).
- Establishment of a bunkering and refueling facility for Green Hydrogen – Led by the V. O. Chidambaranar Port Authority (Tuticorin Port).

5.4.2 The Scheme Guidelines for implementing pilot projects for the use of Green Hydrogen in the steel sector under the Mission were published on February 2, 2024. MECON has been designated as the Scheme Implementing Agency. The Ministry of Steel has awarded three pilot projects aimed at hydrogen injection in Direct Reduced Iron (DRI) plants, with a total steel production capacity of 3,290 tons per day. A funding allocation of approximately ₹347 Crore has been made for these projects. Additionally, proposals for hydrogen injection in existing blast furnaces and vertical shaft DRI are currently under evaluation.

5.4.3 The Scheme Guidelines for implementing pilot projects for the use of Green Hydrogen in the transport sector under the Mission were published on February 14, 2024. The Automotive Research Association of India (ARAI) has been designated as the Scheme Implementing Agency. In the transport sector, four pilot projects have been awarded to deploy 36 hydrogen-fueled vehicles and 8 Hydrogen Refueling Stations (HRS), with a total financial support of approximately ₹191 Crore.

5.4.4 Scheme Guidelines for Implementation of Pilot Projects for production and use of Green Hydrogen using innovative methods/pathways in the Residential, Commercial, Localized Community, Decentralized/ Non-Conventional, applications, including any new sector or technology not covered in previous Mission Schemes have been issued on 8th November, 2024.

5.5 The Scheme Guidelines for setting up Hydrogen Hubs in India were issued on March 15, 2024, as part of the mission. To implement this initiative, the SECI has been designated as the Scheme Implementing Agency. In line with this, SECI floated a Call for Proposals (CfP) for the establishment of Green Hydrogen Hubs on August 20, 2024, inviting stakeholders to participate in the development of these hubs. The last date for submission of proposals was December 6, 2024.

5.6 The Guidelines for the scheme on skilling, upskilling, and reskilling were issued on March 16, 2024. The National Skill Development Corporation (NSDC) has been designated as the Scheme Implementing Agency. Additionally, 37 Qualification Packs (QPs) have been approved by the National Council for Vocational Education and Training (NCVET).

5.7 On August 18, 2023, the Ministry notified the Green Hydrogen Standard. Following this, there was a need to develop a comprehensive methodology for the measurement, monitoring, reporting, onsite verification,

and certification of Green Hydrogen and its derivatives. The Bureau of Energy Efficiency (BEE) has been designated as the nodal authority responsible for accrediting agencies for monitoring, verification, and certification of Green Hydrogen projects.

A draft scheme for Green Hydrogen Certification was published on MNRE's website in September 2024 for seeking stakeholder comments. The comments have been compiled and formulation of responses is under process.

5.8 On July 4, 2024, the MNRE released the Scheme Guidelines for funding testing facilities, infrastructure, and institutional support for the development of standards and a regulatory framework under the National Green Hydrogen Mission. A Call for Proposals (CfP) was issued by NISE on August 16, 2024, with the submission deadline extended to November 15, 2024. Proposals are currently being evaluated for funding to support testing facilities, infrastructure, and institutional initiatives related to the development of the standards and regulatory framework.

5.9 Under the R&D scheme, a call for proposals was issued to invite research and development projects from eligible entities. More than 400 proposals have been received across four key categories: Production, Storage and Transportation, Safety, and Applications. As of December 31, 2024, seven projects under the Safety category have been awarded, while detailed evaluations for other categories are ongoing. Additionally, proposals were invited for establishing a Centre of Excellence (CoE) under the R&D scheme, with 100 applications received.

5.10 A robust framework of Regulations, Codes, and Standards (RCS) is an essential prerequisite for establishing the Green Hydrogen ecosystem. To initiate work in this direction, the Ministry has already constituted a Working Group (WG) comprising relevant Ministries, Government agencies, standardization bodies, regulators, and industry stakeholders. Considering the substantial volume and scope of activities, thematic sub-groups have been constituted to work on RCS related to different aspects of the Green Hydrogen value chain. This initiative has been further expanded with the creation of three additional sub-groups on Shipping, Aviation and Railways.

5.11 Under Article 6.2 of the Paris Agreement, discussions are ongoing for draft Memoranda of Cooperation with several countries and regions, including Germany, Italy, the European Union, Slovenia, Greece, France, South Korea, and Sweden.

5.12 MNRE has actively participated in and organized a series of key events, conferences, and workshops aimed at advancing the green hydrogen mission, and fostering international cooperation.

5.12.1 The Ministry of New and Renewable Energy (MNRE) and the Office of the Principal Scientific Adviser to the Government of India, in collaboration with the Ministry of Petroleum and Natural Gas, the Department of Science and Technology, and the Department of Scientific and Industrial Research, organized the 2nd International Conference on Green Hydrogen (ICGH) from September 11-13, 2024 at Bharat Mandapam, New Delhi. The Solar Energy Corporation of India (SECI) served as the implementation partner, while EY was the knowledge partner, and Federation of Indian Chambers of Commerce and Industry (FICCI) acted as the industry partner.

The conference was inaugurated by Prime Minister Shri Narendra Modi through a virtual keynote address. The event commenced with the inauguration of an exhibition showcasing innovations in the Green Hydrogen sector by Hon'ble Minister of New and Renewable Energy, Shri Pralhad Venkatesh Joshi, and Hon'ble Minister of Petroleum and Natural Gas, Shri Hardeep S. Puri.

Building upon the success of the first edition, this year's conference was significantly larger, featuring several innovative components such as the Green Hydrogen Hackathon (GH2THON), a youth-focused session titled Green Hydrogen for Youth, and poster and quiz competitions. These initiatives aimed to engage a diverse group of participants and promote innovation in the Green Hydrogen sector. The event was attended by over 2,000 national and international delegates, including academicians, industry experts, startups, policymakers, and diplomats, making it a key platform for global discussions on advancing green hydrogen technologies.

Fig. 5.1

5.12.2 MNRE held a day-long workshop on "Quality Control in Green Hydrogen: Standards & Testing Infrastructure" at Sushma Swaraj Bhawan, New Delhi on May 8, 2024. The workshop focused on the necessary actions to establish a standardized ecosystem for Green Hydrogen production by defining clear quality standards. A dedicated portal for the National Green Hydrogen Mission was also launched, jointly by Principal Scientific Advisor to Government of India Prof. Ajay Kumar Sood and Secretary, Ministry of New and Renewable Energy, Shri Bhupinder S. Bhalla. The workshop saw participation from approximately 300 stakeholders from ministries, PSUs, government agencies, industry, associations, research institutes, laboratories and academia .

Fig. 5.2

5.12.3 MNRE hosted the 41st Steering Committee Meeting of the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) from March 18 to 22, 2024, at Sushma Swaraj Bhawan, New Delhi. The meeting brought together IPHE delegates from Austria, Chile, France, the

European Commission, Japan, Germany, the Netherlands, the UAE, the UK, the US, Singapore, and South Korea, along with representatives from the host country, India. Discussions were held on a wide range of issues related to the deployment of Green Hydrogen and its derivatives.

Fig. 5.3

5.12.4 India set up its own pavilion, at the World Hydrogen Summit 2024, held in Rotterdam, Netherlands, during May 13 – 15, 2024. This pavilion was inaugurated by Secretary, Ministry of New and Renewable Energy, Shri Bhupinder S. Bhalla. The Indian delegation comprised nominees from Ministry of New & Renewable Energy, Department of Science and Technology, Ministry of Railways, Ministry of Petroleum and Natural Gas and representatives from private and public sector companies as well.

Fig. 5.4

5.12.5 World Hydrogen and Fuel Cell Day was again celebrated on 8th October 2024 at MNRE Atal Akshay Urja Bhawan. This brought together Hydrogen experts from the industry, academia and government. The National Centre for Hydrogen Safety was also launched at the event.